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TABLE OF CONTENTS

Biomedical Technology Prosperity Game
Players' Handbook

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INTRODUCTION

A Prosperity Game is a new type of forum for simulating and exploring complex issues in a variety of areas including economics, politics, sociology, environment, education, research, health care, etc. The issues can be examined from a variety of perspectives ranging from a global, macroeconomic and geopolitical viewpoint down to the details of customer/supplier/market interactions in specific industries. The concept originated in meetings with the staff of New Mexico Senator Jeff Bingaman, with Lee Buchanan of the Advanced Research Projects Agency, and with other government and industry people, and was developed by J. Pace VanDevender and Marshall Berman for a wide variety of applications.

Prosperity Games simulate and explore complex issues

Prosperity Games are an outgrowth of move/countermove and seminar war games. They are executive-level interactive simulations that encourage creative problem solving and decision-making, and explore the possible consequences of those decisions in a variety of economic, political and social arenas. The simulations are high-level exercises of discretion, judgment, planning and negotiating skills, not computer games. They explore the challenges and opportunities faced by businesses, government, laboratories, universities and the public.

Ten previous Prosperity Games have explored environmental issues, economic competitiveness in electronics manufacturing and information technology, university business education, the business case for diversity, and the relationships of the Department of Energy National Laboratories. This is the first game that focuses on biomedical technologies.

GAME THEORY

In mathematics, game theory is the study of strategic aspects of situations of conflict and cooperation. "Game Theory approaches conflicts by asking a question as old as games themselves: How do people make 'optimal' choices when these are contingent on what other

people do?"[1] Game theory originated with the mathematician John von Neumann as early as 1928. The collaboration of von Neumann on theory and Oskar Morgenstern on applications to economic questions led to the seminal book *The Theory of Games and Economic Behavior* that first appeared in 1944, and was later revised in 1947 and 1953. Game theory is an approach to developing the best strategies in areas such as economics and war to beat a competitor or enemy. [Of course, one possible strategy is to convert an enemy into an ally, or a competitor into a partner!]

A game is defined by a set of rules that specify the players, their desired goals, allowed interactions, and a method of assessing outcomes. There can be one or more goals with different levels of importance. The players adopt strategies, and the interactions of the "moves" based on those strategies lead to outcomes which may or may not be consistent with the players' goals. Complex games involve look-ahead strategies that address the different possible moves that an opponent could make. It is important to try to understand an opponent's goals in order to maximize the probability of a favorable outcome. Games can be sequential, with player interaction allowed between moves.

Games should involve look-ahead strategies

OBJECTIVES OF THIS GAME

The Biomedical Prosperity Game© is designed to accomplish the following specific and general objectives:

SPECIFIC:

- Identify advanced/critical technology issues that affect the cost and quality of health care.
- Explore the development, patenting, manufacturing and licensing of needed technologies that would decrease costs while maintaining or improving quality.
- Identify policy and regulatory changes that would reduce costs and improve quality and timeliness of health care delivery.
- Identify and apply existing resources and facilities to develop and implement improved technologies and policies.
- Begin to develop a Biomedical Technology Roadmap for industry and government cooperation.

Identify critical technology issues that affect the cost and quality of health care

GENERAL:

- Develop partnerships, teamwork, and a spirit of cooperation among health care consumers and providers, researchers, regulatory agencies, industry, government, and other stakeholders in the health care system.
- Increase awareness of the needs, desires and motivations of the different stakeholders.
- Bring conflict into the open and manage it productively.

[1] From Steven J. Brams, "Theory of Moves," *American Scientist*, **81**, 562-570, November-December 1993.

- Explore long-term strategies and policies.
- Provide input for possible future legislation.
- Stimulate thinking.
- Provide a potentially life-altering learning experience.

Freedom rings where opinions clash
- Adlai E. Stevenson

The game will explore biomedical technology simultaneously from three points of view. The **consumers** represent patients and their problems, including diseases and disabilities, costs for services as well as insurance, treatment options, and overall quality of care and quality of life. All **providers** and related organizations involved in health care are represented including doctors, hospitals, research organizations, manufacturers, and the problems they encounter such as costs, delivery systems, regulations, research and development, etc. Since health care costs consume 14.1% of US gross domestic product and 18.5% of total public spending, this area is of utmost importance to the **nation**. Health care costs are also reflected in the costs of all products and services, and affect our ability to compete internationally. Hence, private and public representatives of national stakeholders are included in the game including legislators, insurers, government customers and payers, lawyers, etc.

Over the course of the game, patients will develop diseases, disabilities, and aging problems that will be treated by doctors and nurses using available technologies, and new technologies developed during the game. Suppliers, manufacturers, congressional representatives, researchers, national laboratories, regulators, lawyers, insurance companies, finance, and news media will all play their real-life roles.

Results of the game will be combined with the expertise of a large group of health care professionals and stakeholders to help create a Technology Roadmap for the future of the health care system in biomedical engineering.

GAME CONCEPT

Teams:
The game incorporates eleven basic teams:

Consumers that represent patients from all demographic groups in the US.
Two Provider teams. One represents independent physicians and hospitals and IPAs (Independent Practice Associations) who bill on a fee-for-service basis, and the other represents Health Maintenance Organizations (HMOs).
Insurance Payers that represent private and public (Medicare, Medicaid) insurance organizations. Large companies are also represented in their role of insurance provider.
Legislators representing the US Congress and State legislatures.
Suppliers/Manufacturers representing companies that make and sell biomedical devices and equipment.
US Food and Drug Administration and State Regulators
Planning/Funding Organizations that represent the private and public (including the Department of Defense, National Science Foundation, private foundations, etc.) organizations that provide resources to fund research and development of new biomedical technologies and that perform strategic planning.

Universities/Laboratories that perform the research and development of new technologies.
Lawyers that provide consulting and legal assistance to all parties.
Control Team: Directs the conduct of the game, resolves all disputes, and plays all other roles required in the game including financial institutions, news media, scientific publications, foreign countries, polling, computing, etc.

Players:
Every Prosperity Game is unique because the outcomes depend on the players. Players have been selected to represent their real-life roles as faithfully as possible. Their creativity and commitment to the simulation determine the success of the game. A list of the players and their team assignments is given in Appendix A. The game schedule is described in Appendix B.

Game Description:
The primary game objective is to explore existing and future biomedical technologies, with emphasis on lowering costs and maintaining quality. This exploration will require highly skilled players with a strong knowledge of the biomedical field, the ability to read and digest a significant amount of information, and the confidence to make decisions, observe their consequences, and alter their decisions accordingly.

The play runs from January, 1996 to the end of 2003, a compression of eight years into one and a half days. This time compression of 2000:1 (1 game minute 1.5 days) means that many aspects and issues will be treated very approximately. No significant accuracy is claimed for estimates of research and treatment costs or quality of care. The game design is only intended to qualitatively capture these concepts to assist decision makers in understanding today's environment and the possibilities of significant future improvements. This learning process will be used to build a Biomedical Technology Roadmap that incorporates technical and policy changes that will ultimately benefit the nation with lower costs and high quality health care.

The central theme of the game, as in real life, is the relationship between the patients (consumers) and the medical treatment world (providers) in the event of accident, illness, disability or aging. The patients are provided with Disease/Disability (D/D) cards that describe their assigned age and symptoms. The D/D cards list: treatment options that are available in 1996; placeholders for new technology-based treatments that may be developed during the play; the various possible outcomes and associated probabilities; and estimates of direct treatment costs and long-term costs to society by either dying, remaining ill, or completely recovering and returning to the workforce. As the game progresses in time, additional technology treatment options are created to replace the placeholders on the cards.

The game will focus on the major diseases, disabilities and accidents that provide opportunities for improving quality and lowering costs through applications of new technologies. The players will be encouraged to develop innovative technologies across a broad set of biomedical technology areas. These areas have been grouped into the following preliminary categories as a starting point for the players' consideration:

Technology Areas:

1. Advanced diagnostics
2. Assistive technologies for the elderly and disabled
3. Energy delivery devices (lasers, ultrasound, etc.)
4. Health Informatics
5. Microelectronics and sensors
6. Minimally invasive therapies
7. Outcomes research tools
8. Telemedicine

These technologies include only medical devices, diagnostic systems, and health care information systems. Technology includes the results of engineering analysis, design, and materials; and product development entailing hardware (electronic, mechanical, electro-mechanical), software, and systems approaches. Drugs will not be investigated in this game. However, if a team decides that drugs are the only viable approach, we will note that in the game records.

Similarly, policy issues can be proposed, discussed and implemented throughout the game. Our goal is not to reform the entire medical system. Rather, these policies should address ways to improve the processes involved in funding, developing, testing, approving, and marketing new technologies with special emphasis on reducing costs while increasing the quality of care. A tentative list of policy areas might include:

Technology-Related Policy Areas:

1. Legislative changes; regulatory improvements and reforms
2. Government incentive programs
3. Information surety and security
4. Tort liability reform
5. Metrics and systems for evaluating the costs and increases in health care quality resulting from the introduction of new technologies
6. Funding allocation systems

Several diseases and/or disabilities (due to illness, accidents, battlefield casualties, or aging) are defined for each of the technology areas, and provide the basis for the D/D cards. The cards will address at most four possible generic outcomes with associated probabilities and returns on investment for working life up to age 65 (these outcomes can be modified according to the particular disease/disability); life expectancy is assumed to be 75 for all patients. D/D cards will be given to individual consumers describing their condition and treatment options. In addition, the Provider teams will be given "team" D/D cards representing global health care problems that need to be solved by their team (e.g., breast cancer screening or disaster evaluation and triaging).

For the first part of the game, only current technologies are available for treatment. All new technologies must be developed either through Toolkit Options (q.v.) or through the natural processes of the game (i.e., research, development, patenting, licensing, clinical testing, regulatory approval, manufacturing, marketing, gaining insurance coverage, etc.).

At the start of the game, the Provider teams will be given copies of all D/D cards with their detailed information. During play, the doctors provide care to their patients, choosing among the available options, taking into consideration the patient's insurance and income, overall health, and any other considerations deemed important.

For the latter part of the game, the Control team will keep the providers abreast of the newly developed and licensed technologies, including costs, and possible outcomes and their probabilities. All new technologies include costs associated with research and development.

The game will simultaneously explore two dynamic systems: the health care delivery system and the technology development and marketing system. The delivery system encompasses three tightly knit teams: consumers, providers and insurers (the "triad"). The consumers have discretionary income that can be used to purchase health insurance and save for personal expenses such as copayments. The private insurers spread the risk among the mix of healthy and sick people and seek to make a profit. Government insurers cover a segment of the population including the elderly or poor. Providers deliver health care directly to their patients and also seek to profit from their labors.

The technology system encompasses the research funders and doers, the suppliers and manufacturers, and the regulatory agencies. Their objectives are to create new technologies and products that are safe and effective, and deliver them to the health care providers.

The legislators strongly influence both systems. They provide a large fraction of the money needed in the health care triad, as well as supporting research and development of new and improved technologies. They can also set national objectives and policies for a large fraction of the health care expenditures.

Lawyers can also play roles in both systems. They can be involved in litigation between any of the stakeholders (e.g., malpractice suits, product liability litigation, etc.). They can also assist in securing and defending intellectual property rights, lobbying, and mediating disputes.

The two dynamic systems can have other possible crossover connections. The providers might like to purchase new technology products from the suppliers; the suppliers might like to assist the providers in obtaining insurance coverage for new treatment options; the patients might try to influence specific legislation, or even invest in certain technologies. As will be discussed later, each system has its own currency (green for the triad, yellow for technology development) to meet its primary objectives, but crossovers are allowed using simple conversion factors.

This next section provides an overview of the flow of the game and roadmapping sessions. The subsequent sections provide: 1) team descriptions, challenges and opportunities; 2) explanations of D/D cards; 3) a discussion of Toolkit options; 4) an explanation of money used in the game; 5) detailed instructions for each team; and 6) a brief summary of game rules.

PLAYING THE GAME

The Prosperity Game/Technology Roadmap exercise includes seven sessions or distinct time periods. Sessions 1 through 4 comprise the Prosperity Game simulation. It explores empathic and learning experiences, collaborative and competitive interactions, experimentation, decision making, and innovation. The game and life experiences of the players are collected, discussed, prioritized and documented in the roadmapping exercises of Sessions 5 through 7. A final debriefing allows the teams to share their experiences with the entire group.

The primary "move" in the game is represented by an agreement or contract. These agreements are negotiated among two or more teams and must represent an exchange of value for value. Figure 1 shows the form used for documenting agreements. No agreement is official until signed by all parties and the Control Team, with representatives of all parties present. If the agreements involve uncertain future outcomes, these will be determined probabilistically by the Control team for the final execution. The agreements must be accompanied by the amount of money being transferred between partners. Two secondary "moves" include investments in Toolkit options, and D/D cards with their associated outcomes, costs, and quality evaluations.

All teams are provided with a list of near-term and long-term challenges (see pages 17-21). This information, coupled with the experience and expertise of the players, launches them into the real-world simulation of the game. The game is "won" by successfully meeting the prescribed challenges and accomplishing the long-term objectives of the teams and individual players. Circumventing the game is not winning. Players should seek to accomplish their goals following the most realistic alternatives available.

Session 1: 1996-1997 This session is for strategic planning and organizing your team to best deal with the coming events. Decide on groundrules for making decisions, who will play what roles on the team, assignment of responsibilities, processes for accountability and correcting errors. Resolve outstanding questions about the game. Review your current state and where you would like to be in 8 - 10 years. Discuss the challenges provided in this Handbook and add others of your choosing; prioritize the list. Review the detailed descriptions of your team and other teams, and know the deadlines and deliverables (penalties for missing deadlines can be severe). No money is disbursed in Session 1. However, consumers need to prepare for purchasing insurance at the start of Session 2. The insurance team must have policies completed and be ready to discuss these with the consumers prior to the end of Session 1. Three sample policies will be provided: private/independent, private/HMO, and government. If insurers miss their deadline, the sample policies become official and they must make these available to the consumers. Legislators need to develop a budget to insure that appropriations to all other teams are completed at least five minutes before the start of Session 2.

Figure 1. Form for all agreements and contracts

AGREEMENT FORM

THE TERMS AND CONDITIONS OF THIS AGREEMENT ARE AS FOLLOWS

_____

_____

_____

_____

_____

_____

_____

50% Probability Cost: $_____ _____ _____
Control Team Time

APPROVALS AND FUND TRANSFERS:

Team Transferring	Amount	Team Receiving	Transferring Team Signature
_____	$_____	_____	_____
_____	$_____	_____	_____
_____	$_____	_____	_____
_____	$_____	_____	_____

Investment was: ☝ Successful ☝ Unsuccessful

Approval by: _____ _____ _____
Control Team Date Time

In the event that legislators miss their deadline, the Control team will appropriate 1998 funds according to the same percentages as in 1996.

Research funders plan their 1998-1999 expenditures in discussions with universities/national labs, the legislators, and others.

Session 2: 1998-1999 The legislators appropriate their funds and the team recorder (staff person assigned to team) disburses these funds to the appropriate teams. Patients buy insurance. Patients (Consumer team) randomly select D/D cards from their team recorder. Patients are responsible for the entire D/D process. They get two copies of D/D-Quality cards from the Control team, along with appropriate props (e.g., blindness is simulated with foggy glasses or blindfolds; wheelchairs or walkers are available, etc.). They go to providers in search of relief or cures. Providers diagnose and treat patients with current technologies. Patients must obtain insurance money and pay for services provided - no charity. Analysts and/or Control team calculate treatment outcomes and related costs based on algorithms and probabilities generated earlier. Results are provided to patients and physicians and implemented or simulated. If patients are not returned to health in two years (one session), then they continue their treatment in the next session. If they are completely cured, they then pick new D/D cards. Patients undergoing diagnosis or treatment can use their time as efficiently as they wish. They may think, read magazines, or, if their condition permits, they may negotiate with each other and with other teams to accomplish their goals (e.g., they may lobby the legislature for action in certain biomedical technology areas). Patients who die cannot return to their original teams until the next session.

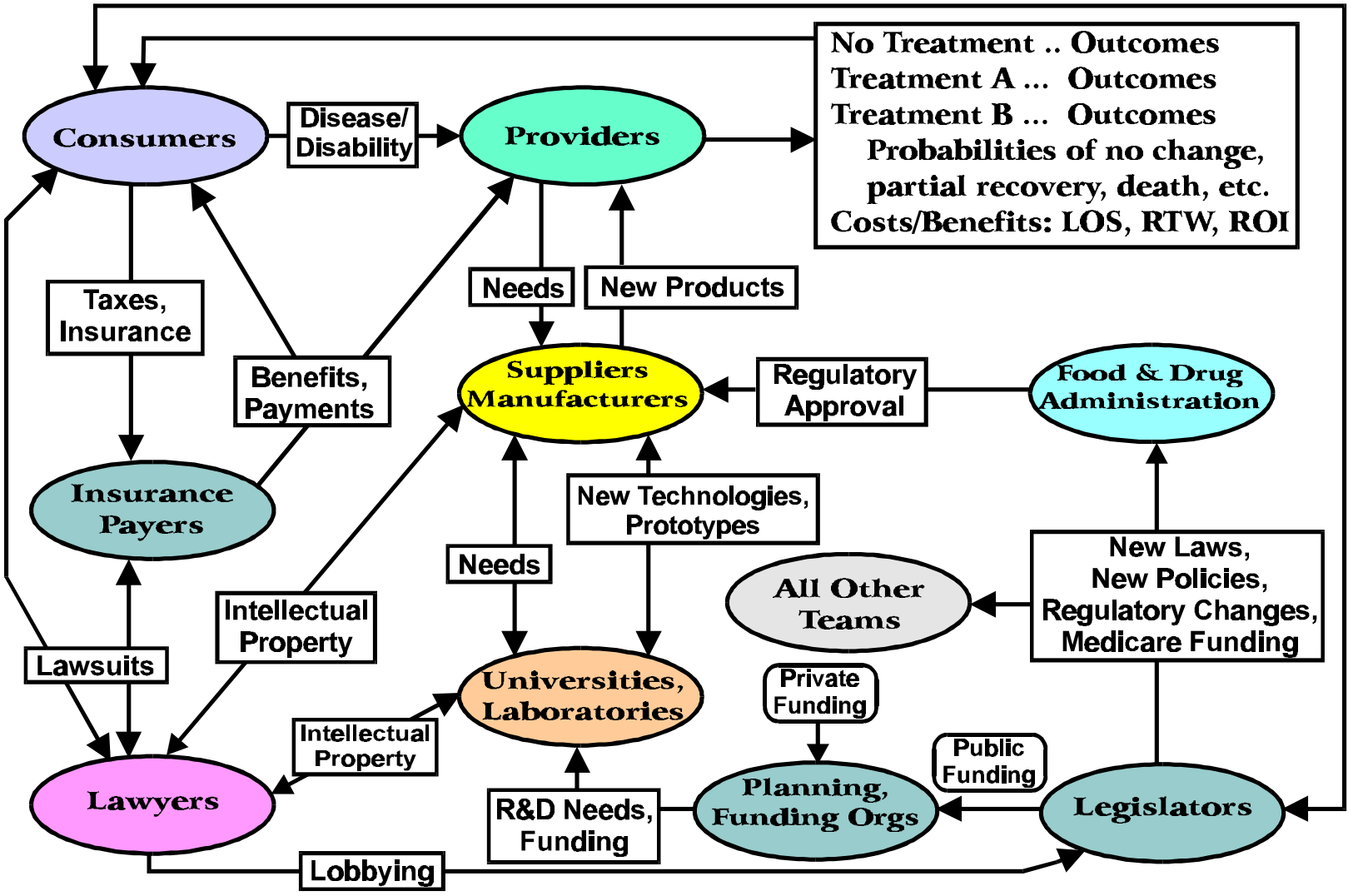
The Providers are also given four team D/D cards that will stimulate discussion of priorities over the course of Sessions 2 - 4. Providers should also consider purchasing malpractice insurance from the lawyers.

All teams must complete their Toolkit investments and turn them in to Control team by the middle of Session 2. Teams are responsible only for their own Toolkit investments. However, they are encouraged to discuss pooling their Toolkit resources with other teams to increase the likelihood of success. Those discussions can be informal or formalized by an agreement between two or more teams. However, the Control team will only acknowledge each team's individual Toolkit submission. Session 2 also creates the basic kernel for Sessions 3 and 4.

Figure 2 illustrates some (not all) of the possible interactions that could occur during Sessions 2 - 4. This experiential process develops the relationships and provides the inputs and innovative thinking that are used in the development of the Biomedical Technology Roadmap.

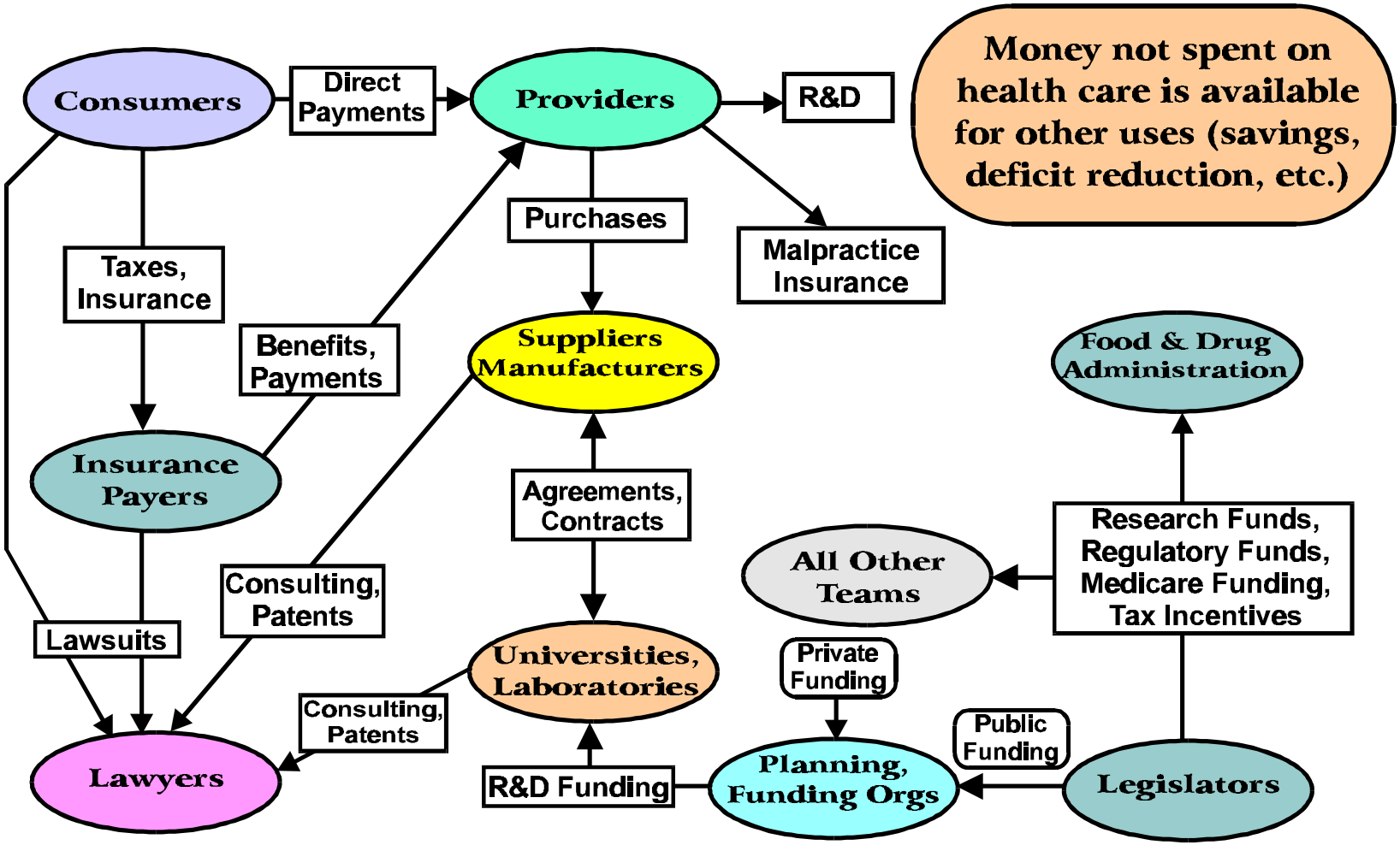
Other teams play their roles, negotiate with each other, and interact with consumers and providers. They develop research plans; get sponsors and funding; get products patented, licensed and manufactured for use in subsequent years. The flow of money between teams is sketched in Figure 3.

Figure 2. Schematic of Some Possible Team Interactions



MBerman8/21/95

Figure 3. Flow of Money Through the System



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After the Toolkit option investment period ends, the teams must use the "standard" realistic processes for developing and marketing new technologies. NO Toolkit investments carry over to this process - all teams start from scratch. They may begin development of Toolkit options that failed, or create their own technologies. Table 1 illustrates the full process for technology development, licensing and marketing as it currently exists. Changes and improvements in this process can be accomplished in the game by negotiating agreements among all affected stakeholder teams. All determinations of future results (e.g., successful research, successful clinical testing, etc.) are determined probabilistically after assigning a mean investment and mean time. In the context of the game, all specified long-duration events (such as conducting clinical trials) can be assumed to have already been accomplished in the event of a successful outcome. Representatives from all negotiating parties must bring the agreements and money to Control for acceptance, probabilistic determinations, and confirmation. Players are encouraged to develop ideas that will simplify and speed up this process.

Table 1. STANDARD PROCESS FOR TECHNOLOGY DEVELOPMENT

Action	Affected Teams	Move
Funding agencies get money for desired R&D	Legislators, FundingOrgs, Universities/Labs, et al.	Agreements - money transfer
Disburse funds	FundingOrgs, Universities/Labs, et al.	Agreements - money transfer
Perform R&D	Universities/Labs, Suppliers/Manufacturers	Agreements - probability assignment and dice roll; possibly money transfer
Secure intellectual property rights	Lawyers, Universities/Labs, Suppliers/Manufacturers, Control team = patent office	Agreements - money transfer
Negotiate terms (time, cost, etc.) of clinical testing and conduct trials	FDA, Universities/Labs, Suppliers/Manufacturers	Agreements - probability assignment and dice roll; possibly money transfer
Get FDA approval	FDA, Universities/Labs, Suppliers/Manufacturers	Agreements - possible money transfer
Manufacture technology and products	Suppliers/Manufacturers, Control team	Agreements - money transfer
Sell technology to providers	Suppliers/Manufacturers, Providers	Agreements - money transfer
Convince insurers to cover treatment costs	Suppliers/Manufacturers, Providers, Insurers	Agreements - money transfer
Technology becomes available for treating patients.		

Session 3: 2000-2001 SuccessfulToolkit options will be announced and implemented into the game. Session 2 activities will continue. Consumers will select new D/D cards depending on previous outcomes. Doctors may use any new technologies developed (and FDA-approved) over the last two years. Policy changes in insurance, regulatory requirements, etc. will also be

incorporated into the game. Champions of particular technologies and policies should pursue the agreements necessary to bring their ideas to fruition.

Session 4: 2002-2003 Repeat Session 3 updated two more years. The simulation ends at the end of Session 4. Late advances and successes will be documented in the final report of the game.

Session 5: Identify Problems and Solution Areas This session begins the roadmapping efforts. Based on the game and life experiences, each team identifies the most important issues, problems, challenges and potential solutions for employing technologies and related policies in reducing costs and increasing quality. These issues are prioritized and then the top one or two issues and their rationales are presented to the entire group in plenary session. Table 2 shows the template that will be used to identify issues and solutions and categorize these into major technology and policy areas. At the end of Session 5, players will be polled to determine their first choice for an area to pursue in greater depth.

Session 6: Roadmapping Technologies and Policies The information produced in Session 5 will be assembled into the form shown in Table 3. The team tables will be labeled according to technology and policy areas. Players will move to those tables that are of primary interest to them, based on the preferences expressed at the end of Session 5. Tables may contain one or two areas. In the first ten minutes, the reassembled players will then create a vision statement for the future of their technology or policy area (with a minimum amount of wordsmithing!). They will then begin to flesh out their thinking on the key elements of a Biotechnology Roadmap. Table 4 shows a sample template. Following are definitions of key terms that may be useful in this endeavor:

DEFINITIONS:

Vision - A high-level view of the purpose of the particular technology area in health care.

Champions - People who will lead, provide guidance for and participate in further roadmapping exercises. It is likely that champions will be responsible for organizing the teams who will create and document the roadmaps.

Objectives - Goals identifying the future advances in the particular technology area.

Drivers - Specific characteristics of technologies that must be available to achieve the desired objective.

Sub-technologies - Classes of technologies that hold promise in enabling the objective.

Sponsoring organizations - Potential funders, researchers, etc., related to the sub-technology classes or technology drivers.

Attributes - Specifics related to the objective, such as cost, size, speed, policy, technical requirements, etc.

Table 2. THE ROLE AND IMPACT OF TECHNOLOGY IN HEALTH CARE COSTS AND QUALITY

Problem or Issue (specific to your team, many teams or the nation; Include needs/attributes related to issue):	**Team:** Consumers
There is a general lack of access to the most recent and effective technologies in rural areas.	**Issue Number:** 1
	Relative Priority: (1=very low to 5=very high) 4
	Priority Ranking: (1=first, etc.) 2

Possible Solutions:

- *Increase number of doctors in rural areas using government subsidies.*
- *Offer government loans for medical education for students who will spend five years in rural areas.*
- *Link rural areas to major medical centers through telemedicine.*
- *Make new technologies more mobile; bring to rural areas on a scheduled or emergency basis.*

MAPPING INTO SOLUTION AREAS (Check all that apply)

Technology Areas:		**Technology-Specific Policy Areas:**	
1 Advanced Diagnostics	*X*	**1 Legislative/Regulatory Reform/Improve**	
2 Assistive Technologies	*X*	**2 Incentive Programs**	*X*
3 Energy Delivery Devices		**3 Information Surety and Security**	
4 Health Informatics	*X*	**4 Tort Liability Reform**	
5 Microelectronics and Sensors	*X*	**5 Metrics and Systems for Cost/Quality**	
6 Minimally Invasive Therapies	*X*	**6 Funding Allocation Systems**	
7 Outcomes Research Tools		**7**	
8 Telemedicine	*XX*	**8**	
9			
10			
ADD YOUR OWN AREAS		**ADD YOUR OWN AREAS**	

Provide additional details about this new area(s):	**Provide additional details about this new area(s):**

Table 3. TECHNOLOGY / POLICY MATRIX MAP

Team:	Consumers					
Issue Rank:	1	2	3	4	5	6
Legend ✷✷ = Main areas ✷ = Other related areas **Issues →**	*There is a general lack of access to the most recent and effective technologies in rural areas.*					
Technology Areas:						
1 Advanced Diagnostics	✷					
2 Assistive Technologies	✷					
3 Energy Delivery Devices						
4 Health Informatics	✷					
5 Microelectronics and Sensors	✷					
6 Minimally Invasive Therapies	✷					
7 Outcomes Research Tools						
8 Telemedicine	✷✷					
9						
10						
Technology-Specific Policy Areas:						
1 Legislative/Regulatory Reform/Improve						
2 Government Incentive Programs	✷					
3 Information Surety and Security						
4 Tort Liability Reform						
5 Metrics and Systems for Cost/Quality						
6 Funding Allocation Systems						
7						
8						

Table 4. GENERAL TECHNOLOGY AREA:	TA8 - TELEMEDICINE		
Vision of the future for the technology area: *Exploit information technologies to deliver medical services between locations.*			**Champions:**
	Current (0-3 years)	**Near-term (3-6 years)**	**Far-term (6-15 years)**
Objective:	• *Intra-organization applications*	• *Inter-organization applications*	• *Global applications*
Drivers:	• *Local area networks* • *Limited knowledge sharing* • *Intra-org. security*	• *Wide area networks* • *Partial knowledge sharing* • *Inter-org. security*	• *Global networks* • *Full, global knowledge sharing* • *Global security*
Sub-Technologies:	• *Communications* • *Computing*	• *Communications (mod. bandwidth, rate)* • *Computing (mod. res. video)*	• *Communications (high bandwidth, rate)* • *Computing (high res, storage, access)* • *Robotics devices*
Sponsoring Organizations:	• • •	• • •	• • •
Attributes:	• *Data rates ...* • *Line cost ...* • *Video resolution ...*	• • •	• • •

Session 7: Continue the Roadmapping exercise using the templates in Table 4. Tables are then reconfigured back to the original team designations.

Outbriefings: Players prepare a final briefing. Each team selects a spokesperson. Topics should cover: Team issues and objectives; Interfaces with others (collaborative, competitive, other); What was learned; and Conclusions. Each team will be allowed no more than 5 - 7 minutes for the presentation.

Wrap up and final polling: Players answer questions, fill out evaluation forms and sign-up for the roadmap follow-on efforts.

TEAM DESCRIPTIONS, CHALLENGES AND OPPORTUNITIES

Consumers:
The US health care system is vitally important to you and your family. You recognize that costs have been rising dramatically, but you want to preserve and improve the current system. You differ among yourselves in values. Some of you demand freedom to choose your own doctors; others are willing to sacrifice some choice in exchange for the lower costs provided from managed care. Some believe that health care is a universal right and entitlement; others that it is a commodity like food. Some of you enjoy stable employment, and employee-funded insurance. Others are elderly or poor. Many among you rely on government insurance programs and are concerned about the future benefits and costs of Medicare and Medicaid.

Challenges:

1. Select the best insurance options you can get.
2. When you become ill or disabled, seek the best medical treatment from the independent providers or the managed-care providers.
3. Do whatever you can as an individual to alter the health-care system by meeting with any of the other teams. Your private and tax dollars support this system. The trade-off between quality and cost of care is vitally important to you.
4. Consider forming a patient advocacy group to promote and defend your interests.
5. Investigate alternatives or improvements in employer-financed insurance.

Provider 1: Independent Physicians and Hospitals:
You are an independent physician, nurse, hospital employee, etc. You are dedicated to high quality care for your patients. You want to provide the best technology available today. However, rising costs are eating into profit margins, and creating conflicts with public and private insurers. You believe that the government is pushing you into more managed care systems to lower costs at the expense of quality and freedom of choice. You are interested in all aspects of the health care world. However, you are kept very busy maintaining your current practice. You would like to stay medically current and generally support new technologies. However, you need help in communicating with some scientists and engineers, and help with administrative and billing systems. You would like to reduce government red tape, reduce costs for malpractice insurance, and reduce the potential for making medical mistakes.

Challenges:

1. Provide appropriate care for the patients who come to you during the game.
2. Insure that you have access to the best available technologies at reasonable cost.
3. Negotiate with other providers to maintain quality and lower costs through collaboration and sharing of equipment, personnel, business practices, etc.
4. Support research on new technologies. Define areas in which technology can improve care and lower costs.
5. Meet with research funding organizations, universities, hospitals, suppliers and manufacturers to learn about new products and to suggest fruitful areas of additional research.
6. Lobby the insurers, legislators, etc. to help further your policies. Negotiate agreements.

Provider 2: HMOs, Managed-Care Systems:
You are a physician, nurse, hospital employee, etc., working in a managed-care facility. Most of you believe that your system is a good way to provide medical care at lower cost. You are dedicated to high quality care for your patients. However, you believe that many diagnostic and treatment protocols are unnecessary and redundant. You also believe that the costs of new technologies can be kept under control by wise use and management practices. You have many ideas for reducing cost, but haven't had the time to develop them. This is your first opportunity to examine the potential of new technologies to lower cost and maintain or increase quality of care. Although still required to treat patients, you have decided to explore new technologies and new policies to advance your values. You are willing to try innovative experiments that may or may not succeed.

Challenges:

1. Provide appropriate care for the patients who come to you during the game.
2. Insure that you have access to the best available technologies at reasonable cost.
3. Negotiate with other providers to maintain quality and lower cost through collaboration and sharing of equipment, personnel, business practices, etc.
4. Support research on new technologies. Define areas in which technology can improve care and lower costs.
5. Meet with research funding organizations, universities, hospitals, suppliers and manufacturers to learn about new products and to suggest fruitful areas of additional research.
6. Lobby the insurers, legislators, etc. to help further your policies. Negotiate agreements.

Insurance Payers:
You represent private and public (Medicare, Medicaid) insurance organizations, and large companies that provide insurance. You are under great pressure to reduce costs. New technologies have generally resulted in increased costs, although the quality of care has been improved. Your resources are finite, and you must choose from available options. You would like to craft new policies for the public and private sectors that would be acceptable to the majority of patients, while not bankrupting the public or private systems. You are interested in new health

care delivery processes, new technologies, methods for measuring costs and quality, collecting data, defining metrics, seeking alternatives to traditional medicine, home care, telemedicine, setting cost-performance goals, etc.

Challenges:

1. Beginning with the current system, begin to revise the private policies for future years, carefully weighing costs, benefits (covered and not covered treatments), pre-existing medical conditions, non-traditional medicine, etc.
2. Develop a revised system for public insurance (Medicare and Medicaid). Lobby the legislature to enact your new policies.
3. Meet with the lawyers to address concerns about malpractice insurance and ways to control costs.
4. Meet with providers to discuss your new policy recommendations.
5. Negotiate agreements with all other stakeholders to improve policies for technology development and usage.
6. Discuss cost shifting between the public and private sectors. Propose solutions.
7. Investigate technology systems and policies for reducing fraud and abuse, double charging, and unnecessary procedures and treatments (estimated to comprise 24% of health care expenditures).

Legislature:
The voters are very concerned about health care. So far, federal and state government attempts at reform have not met with success. Nevertheless, you wield enormous power for change for the better or for the worse. Revenues for the future are fixed; however, if savings are realized, they can be applied to other governmental programs or to reducing the national debt. You need to develop a list of requirements, assign priorities, and allocate future tax income. Creative solutions are encouraged. You should consider technology priorities, quality of life issues, time lines, and metrics to judge your progress. However, given the differing viewpoints among the voters, you must make a strong case for your proposals in order to be reelected.

Challenges:

1. Determine the allocation of resources to the various stakeholders and consumers in the medical community. Raise or lower the fraction of tax dollars devoted to health care.
2. Develop and pass new legislation dealing with the research, development, and introduction of new technologies.
3. Develop new policies in biomedical technologies.
4. State legislators review policies concerning professional certification, medical practice, financing, legal liabilities, regulation, and spending on health care. Innovate!
5. Discuss and debate values. Is medical care a right or a commodity like food? How important is quality of life in the cost vs benefit evaluation? Seek stakeholder inputs. Apply these values in proposed legislation.
6. Get reelected.

7. Develop an appropriate set of metrics to measure cost of care and new technologies in order to base legislation on reality; take future productivity of recovered patients into account.

Suppliers/Manufacturers:
You represent companies that make and sell biomedical devices and equipment. You have your own research facilities but are looking for joint ventures and partnerships with universities and national laboratories for additional R&D. You are concerned that new policies will limit the introduction and acceptance of new technologies.

Challenges:
1. Use your influence to change laws and regulatory practices.
2. Increase your profits.
3. Develop and sell new technologies.
4. Protect your interests by negotiating with other stakeholders.

US Food and Drug Administration and State Regulators:
Your agency oversees $350 billion worth of medical devices and radiation-emitting products. Overall, you oversee more than $1 trillion worth of products, which account for 25 cents of every dollar spent by American consumers. The new Congress is pressuring you to improve your procedures and policies. Many in the medical community believe that the FDA slows the introduction of new technologies, needlessly complicates the licensing procedures, and costs American jobs by sending manufacturers overseas. You have been trying to improve your regulatory processes, but the progress has been slow and painful. You have launched efforts to: exempt many categories of low-risk medical devices from premarket review, to harmonize FDA's drug and device testing requirements with other countries, and to introduce user fees. You have other initiatives underway. Other stakeholders in the medical community would like to work together with you to improve processes, shorten regulatory periods, exempt experimental technologies, and overall to improve the regulatory process. You have also been asked to prove (using data) that current procedures save more lives than are lost by delays.

Challenges:
1. Investigate the trade-offs between risks and benefits of the multi-year clinical trial period and streamline as appropriate.
2. Consider special rapid approvals for experimental technologies when the doctors and patients are willing to accept the risks.
3. Greatly speed up the regulatory process.
4. Reduce costs to inventors and developers of new technologies.
5. Meet with all stakeholders to negotiate tradeoffs on protection of intellectual property, lowering costs, reducing administrative burdens, while simultaneously protecting the health of the public.
6. Develop creative new approaches to regulation.
7. Determine the level of risk that the public is willing to accept and propose changes in policy or legislation based on the results.

Planning and Funding Organizations:
You represent the private and public organizations (including the Department of Defense, ARPA, National Science Foundation, TheKoop Foundation, TheWhitaker Foundation, etc.) that provide resources to fund research and development of new biomedical technologies. There is great competition for scarce resources and your funding decisions must be based on potential impact, risks and uncertainties, and R&D costs.

Challenges:

1. Develop research areas and products that you would like to see explored; get input from health care providers, research institutions, your own needs, etc.
2. Seek funding from public and private sources; lobby the legislature.
3. Allocate resources to research institutions, etc. as appropriate; develop metrics to insure that the desired products are produced and that they deliver the promised results.

Universities/Laboratories:
Some of your laboratories have traditionally performed medical research. Others, like national laboratories, bring a new array of technology products that may have important applications in the medical field. These laboratories face both technical challenges and political issues concerning their contributions. Laboratory management is convinced that partnering in biomedical technologies will both assist the nation and the government in carrying out the labs' missions.

Challenges:

1. Determine the core competencies of each laboratory and institution, and develop procedures for collaboration and cooperation.
2. Determine the most fruitful areas of research to pursue, and who should pursue which area. Seek broad stakeholder input and support.
3. Define a set of research areas appropriate to each organization.
4. Seek funding to support this work.
5. Conduct the research (through probabilistic investments).
6. Negotiate with suppliers/manufacturers to transfer technology and market products.

Lawyers:
You resent the negative image that many people have of lawyers today. You believe that you protect the rights of patients against the "establishment." You also assist inventors in protecting their intellectual property and receiving the fruits of their work. You understand the legal system, and provide assistance to all parties in accomplishing their objectives.

Challenges:

1. As entrepreneurs, seek out customers and offer your assistance (for a fair price). Make a profit.
2. Lobby the legislature to protect your interests and profession.
3. Develop mediation/arbitration policies and systems to reduce litigation costs.
4. Develop and promote policies that improve the health care system (e.g., changes to tort law, malpractice cases, punitive damage caps, product liability claims, etc.).

DISEASE/DISABILITY CARDS

The D/D cards serve many functions in the game. They introduce the players to the important diseases and disabilities in the health care system, list the costs of conventional and advanced treatment options, estimate the costs to develop new technologies, illustrate probabilities of positive and negative patient outcomes and how these might improve with advanced technologies, and estimate the potential return on investment which is dominated by the ability of the consumer to return the productive working population or to reduce the fiscal drain on the health care system. For individual patients, the following is a typical set of outcomes:

Outcome	**Return on Investment**
None (death or no change)	$0
Poor (invalid; unable to work)	-$20,000 per year for expected remaining lifetime
Partial (able to work part time)	+$10,000 per year until age 65
Complete (full recovery)	+$30,000 per year until age 65

These outcomes and returns are used for post-game analysis of the impact of technology on medical costs. However, they illustrate the potential benefits to society of returning patients to the work force or reducing costs for long-term care. For example, Figure 4 is a sample D/D card for "Diffuse Atherosclerosis." The estimated frequency of this condition is about 100,000 cases per year in the US. Currently available treatments include balloon angioplasties and bypass surgery. There is a significant probability of no change or death for both of these procedures. Furthermore, patients may be required to return for additional treatment or surgery in a few years, even if the surgery is successful. Option T33 is a laser device that completely removes atherosclerotic lesions (see Toolkit Option T33). This technology could reduce total treatment costs by a factor of five, and triple the probability of complete recovery for about eight years. The expected return on investment (sum of the products of probability times total return on investment per outcome) for bypass surgery is -$78,000 per patient. With the laser technology, the return is +$64,000. Hence, over the time span of interest (1 to 8 years), the net return to society for the laser treatment (assuming 100,000 patients) would be $6.4 billion dollars (compared to a loss of $7.8 billion), far exceeding the assumed initial technology development cost of $80 million.

There are 32 D/D cards available in the game, as shown in Table 5. Twenty four of these apply to individual consumers (patients) and eight to the provider teams. Half of these patients are assumed to be privately insured through independent providers or HMOs. The other twelve are elderly, poor or military, and are insured by government programs (Medicare and Medicaid). All cards apply to either males or females, since the bill payers may be either regardless of the nature of the disease.

D/D cards 6, 7, 8, 21, 22, 25, 27, and 30 apply to the Provider teams. These cards focus on the potential benefits of diagnostics and prevention in the early detection of diseases (e.g., cancer screening). They also explore the process for adopting new procedures in a conservative HMO system, and the approach to dealing with major disasters.

Figure 5 shows provider card 6 - Breast Cancer Screening.

Table 5. D/D CARDS, INSURANCE TYPE, AND PATIENT DESCRIPTIONS

DD01	Private	Adverse Drug Reaction
DD02	Private	Diffuse Atherosclerosis
DD03	Gov.	Massive Battlefield Injuries
DD04	Private	Knee Osteoarthritis
DD05	Gov.	Blindness
DD06	Provider	Breast Cancer Screening
DD07	Provider	Cancer Screening Interpretation
DD08	Provider	Colon Cancer Screening
DD09	Private	Heart Replacement
DD10	Private	Insulin Dependent Diabetes Mellitus
DD11	Gov.	Hearing Loss
DD12	Gov.	Hip Fracture
DD13	Gov.	Home Bound Patient
DD14	Private	Ischemic Heart Disease Diagnosis
DD15	Private	Ischemic Heart Disease Treatment
DD16	Gov.	Kidney Failure
DD17	Gov.	Liver Replacement
DD18	Private	Lung Cancer
DD19	Private	Lung Replacement
DD20	Gov.	Medication Compliance/Monitoring
DD21	Provider	New Information Dissemination
DD22	Provider	New Procedure Adoption
DD23	Private	Paraplegic
DD24	Private	Premature Birth
DD25	Provider	Prostate Cancer Screening
DD26	Gov.	Quadriplegia
DD27	Provider	Skin Cancer Screening
DD28	Gov.	Tissue Diagnosis
DD29	Private	Unknown Critical Information
DD30	Provider	Disaster Evaluation and Triaging
DD31	Gov.	Burn debridement
DD32	Gov.	Threatened early delivery

Figure 4. Patient Disease/Disability Card

CARD 2	DIFFUSE ATHEROSCLEROSIS							FREQUENCY ~ 100,000/yr.
45 year old, private insurance								
Patient:	A judge has familial hypercholesterolemia with symptomatic multi-vessel coronary artery disease, carotid,							
Doctor:	kidney and leg arterial lesions. Therapeutic interventions are needed.							
Recorder:								
Date/Time:								

Treatment options	Total treatment costs	Technology development cost	Outcome	Probability #	Probability Range	Length of recovery to 65	Length of recovery total	Productivity/ yr/patient	Total return on investment
Balloon angioplasties	$15,000	NA	None (death)	0.30	0.00-0.30	0		0	($15,000)
			Poor	0.35	0.31-0.65	1		($20,000)	($35,000)
			Partial	0.30	0.66-0.95	2		$10,000	$5,000
			Complete	0.05	0.96-1.00	3		$30,000	$75,000
Coronary arteries bypass surgery; carotid	$100,000	NA	None (death)	0.20	0.00-0.20	0		0	($100,000)
and abdominal surgery			Poor	0.30	0.21-0.50	2		($20,000)	($140,000)
			Partial	0.40	0.51-0.90	4		$10,000	($60,000)
			Complete	0.10	0.91-1.00	6		$30,000	$80,000
Not currently available	$20,000	$80M	None (death)	0.10	0.00-0.10	0		0	($20,000)
See option T33			Poor	0.20	0.11-0.30	3		($20,000)	($80,000)
			Partial	0.40	0.31-0.70	6		$10,000	$40,000
			Complete	0.30	0.71-1.00	8		$30,000	$220,000
Not currently available	$25,000	$120M	None (death)	0.05	0.00-0.05	0		0	($25,000)
See option T34			Poor	0.20	0.06-0.25	4		($20,000)	($105,000)
			Partial	0.35	0.26-0.60	8		$10,000	$55,000
			Complete	0.40	0.61-1.00	10		$30,000	$275,000
Not currently available	$25,000	$320M	None (death)	NA		0		0	NA
See option T9			Poor	0.10	0.00-0.10	5		($20,000)	($125,000)
			Partial	0.30	0.11-0.40	10		$10,000	$75,000
			Complete	0.60	0.41-1.00	15		$30,000	$425,000

Figure 5. Provider Team Disease/Disability Card

CARD 6	BREAST CANCER SCREENING								FREQUENCY ~ 10,000,000/yr.
PROVIDER TEAM	In order to reduce mortality, breast cancer screening is vital. Average age 50.								
Team:									
Recorder:									
Date/Time:									
Treatment options	Total treatment costs	Technology development cost	Outcome	Probability #	Probability Range	Length of recovery to 65	Length of recovery total	Productivity/ yr/patient	Total return on investment
Continue current mammograms	$300	NA	None	0.20	0.00-0.20	5		0	($300)
			Poor	0.30	0.21-0.50	10		($20,000)	($200,300)
			Partial	0.30	0.51-0.80	15		$10,000	$149,700
			Complete	0.20	0.81-1.00	15	25	$30,000	$449,700
Not currently available	$300	$40M	None	0.10	0.00-0.10	5		0	($300)
See option T57			Poor	0.20	0.11-0.30	10		($20,000)	($200,300)
If T57 passes, you collect $100K			Partial	0.40	0.31-0.70	15		$10,000	$149,700
			Complete	0.30	0.71-1.00	15	25	$30,000	$449,700
Not currently available	$2,500	$180M	None	0.10	0.00-0.10	8		0	($2,500)
See option T15+T17			Poor	0.20	0.11-0.30	13		($20,000)	($262,500)
If T15+T17 passes, you collect $200K			Partial	0.20	0.31-0.50	15	18	$10,000	$147,500
			Complete	0.50	0.51-1.00	15	25	$30,000	$447,500
Not currently available	$600	$100M	None	0.03	0.00-0.03	10		0	($600)
See option T14			Poor	0.07	0.04-0.10	15		($20,000)	($300,600)
If T14 passes, you collect $300K			Partial	0.10	0.11-0.20	15	20	$10,000	$149,400
			Complete	0.80	0.21-1.00	15	25	$30,000	$449,400

The Provider teams will select four D/D cards at the start of Session 1. They are encouraged to discuss the treatment options and the potential benefits of new technologies. Over the course of the game, the Provider teams will receive income if any of the advanced technology options shown on their D/D cards succeed. The Providers can encourage others to make investments, or make their own investments in Toolkit options or through the standard technology development process. Providers will receive payments in an ascending scale depending on the sophistication and benefits of the new technologies. No income is received for currently available options (labeled NA in the Technology Development Cost column). In the example of Figure 5, providers will receive $100,000 (green game dollars) if option T57 passes, $200,000 for options T15 and T17, and $300,000 for the last option, T14.

Measuring Quality Of Care:
In the game, quality of care will be subjectively measured by a short questionnaire supplied to the patients and their primary physicians. Each will answer the questions independently. Table 6 will be incorporated on the back side of each D/D card.

Detailed Process for Individual Patient D/D Cards
The process for handling D/D cards will proceed most smoothly if all players understand and execute their roles. Table 7 provides the step-by-step process for handling the D/D-Quality cards. Patients who "die" (or achieve no improvement) may not return to their original teams. They may go to the library reading table, attend legislative sessions, learn about health insurance by observing the Insurance Payers team, or otherwise silently observe other teams (in "ghost-like" fashion).

Measuring Cost Of Care
An algorithm will be developed that incorporates information from the disease/disability cards into estimates of costs as a function of time in the game. Costs will include initial treatment, hospital stay, other costs and return on investment. The cost to develop new technologies will also be included. This algorithm will be very simple. It is intended only to provide a rough qualitative estimate, and perhaps guide further, much more comprehensive econometric research. This will be done as part of the post-game analysis.

Table 6. EVALUATING THE QUALITY OF CARE

PATIENT'S (or PHYSICIAN'S) QUALITY CARD

Patient/Doctor: _____

Date: _____ Time: _____

Disease/Disability Card No.: _____

Please circle most appropriate rating:

1 = very bad 2 = bad 3 = neutral 4 = good 5 = very good

Cost was reasonable?	1	2	3	4	5
Treatment was efficient?	1	2	3	4	5
Treatment was appropriate?	1	2	3	4	5
Treatment option minimized risk?	1	2	3	4	5
Was technology adequate?	1	2	3	4	5
Did the treatment improve your quality of life?	1	2	3	4	5
Overall satisfaction:	1	2	3	4	5

Table 7. PROCEDURE FOR HANDLING AND COMPLETING D/D CARDS

D/D CARD PROCEDURES	
ACTION	**RESPONSIBLE PARTY**
1. Buy insurance policy from Insurers	Patient
2. Randomly select D/D card from Consumer Recorder	Patient
3. Go to Control (Cheryl) to get 2 copies of D/D cards and props.	Patient
4. Go to Provider Team (according to insurance) and meet with doctor to discuss treatment options. Decide on an option.	Patient, Doctor
5. Go to Insurance Team to get money for treatment. Return to Provider Team.	Patient, Insurers
6. Pay Provider Recorder full cost of treatment.	Patient, Recorder
7. Recorder takes money, pulls random number, and circles treatment outcome on both patient and doctor D/D cards	Recorder, Patient, Doctor
8. Patient and doctor fill out quality form, sign their D/D copies, and give both to Recorder who also signs and dates to verify completion.	Patient, Doctor, Recorder
9. "Dead" (or "no change") patients may not return to their team until the next session	Patient
10. Other patients may return to their teams and return props if they have sufficiently recovered.	Patient
11. If length of recovery is 1 or 2 years, patient and doctor must keep their D/D cards and return for follow-up treatment the next session.	Patient, Doctor, Recorder

TOOLKIT OPTIONS

Players have two ways in which they can alter the future. One is the conventional approach that involves negotiations and contracts among the stakeholders in a realistic process that evolves within the game. The other way is through Toolkit Options. These are a list of technology and policy options that teams and players can invest in. We have created a list of these options and assigned a total resource investment that would yield a 50% probability of success. Teams determine which of these technology and policy options are important for their desired futures. They invest their own resources and encourage others to partner with them, according to their priorities. Teams are also allowed to create their own Options. "Experts" on the Control team will assign mean investments that would yield a 50% probability of a successful outcome. All investments must be completed and turned into Control by the middle of Session 2. The results will be published at the start of Session 3. All successful technologies and policies will be implemented and become part of the environment of the game.

Toolkit Options provide an indication of some possible advances in technology, or policy changes that might significantly improve health care quality and lower costs. The Toolkit is a shortcut to accomplishing important objectives outside the normal highly expensive and time consuming processes. They are also meant to encourage collaboration among the many stakeholders and to indicate the highest priority technology and policy objectives of the players. Toolkit resources are not available for any other uses in the game. Investments made in unsuccessful options are permanently lost. *Toolkit investments are the responsibility of each team.* Each team must turn in its own Toolkit spreadsheet. The Toolkit options will also be posted on a wall board. Players are encouraged to enter their investments on the board, and observe the investment patterns of other teams. Since the board is unofficial, no team can hold another team liable for mistakes or invest differently from the board entries. However, formal agreements can be made between teams on investments (with Control's signature); violations of those written agreements can be litigated.

The outcomes of the Toolkit investments are determined probabilistically as shown in Figure 6. First, the baseline probability will increase with increasing investment following a normal distribution with mean x and standard deviation σ = x. Hence, an investment of twice the mean, $200M, would yield a success probability of 0.84. To take into account factors other than total investment, a uniform distribution is superimposed on the normal distribution to reflect uncertainties and risks in the real world for accomplishing major technology or policy breakthroughs. This uniform distribution can increase or decrease the baseline probability by as much as 16%. The total investments from all teams are fed into the computer and the success or failure is determined by this process. A list of technology and policy options is shown in detail in Table 8.[1]

The teams can invest up to the maximum allocations shown in Table 8. Those resources represent the approximate dollars allocated (in millions) and relative influences of the different stakeholders. Toolkit dollars that are not invested are lost; they cannot be used in any other way in this game. Most of the Toolkit Options are linked directly with the D/D cards in Table 5 as shown in Table 8.

[1] These options will be reproduced in spreadsheet form in the game. Teams can use Table 8 as a worksheet and then transfer their investment selections to the spreadsheets and turn them in to the Control team.

Figure 6. Probability of Successful Toolkit Option for Cumulative Investments

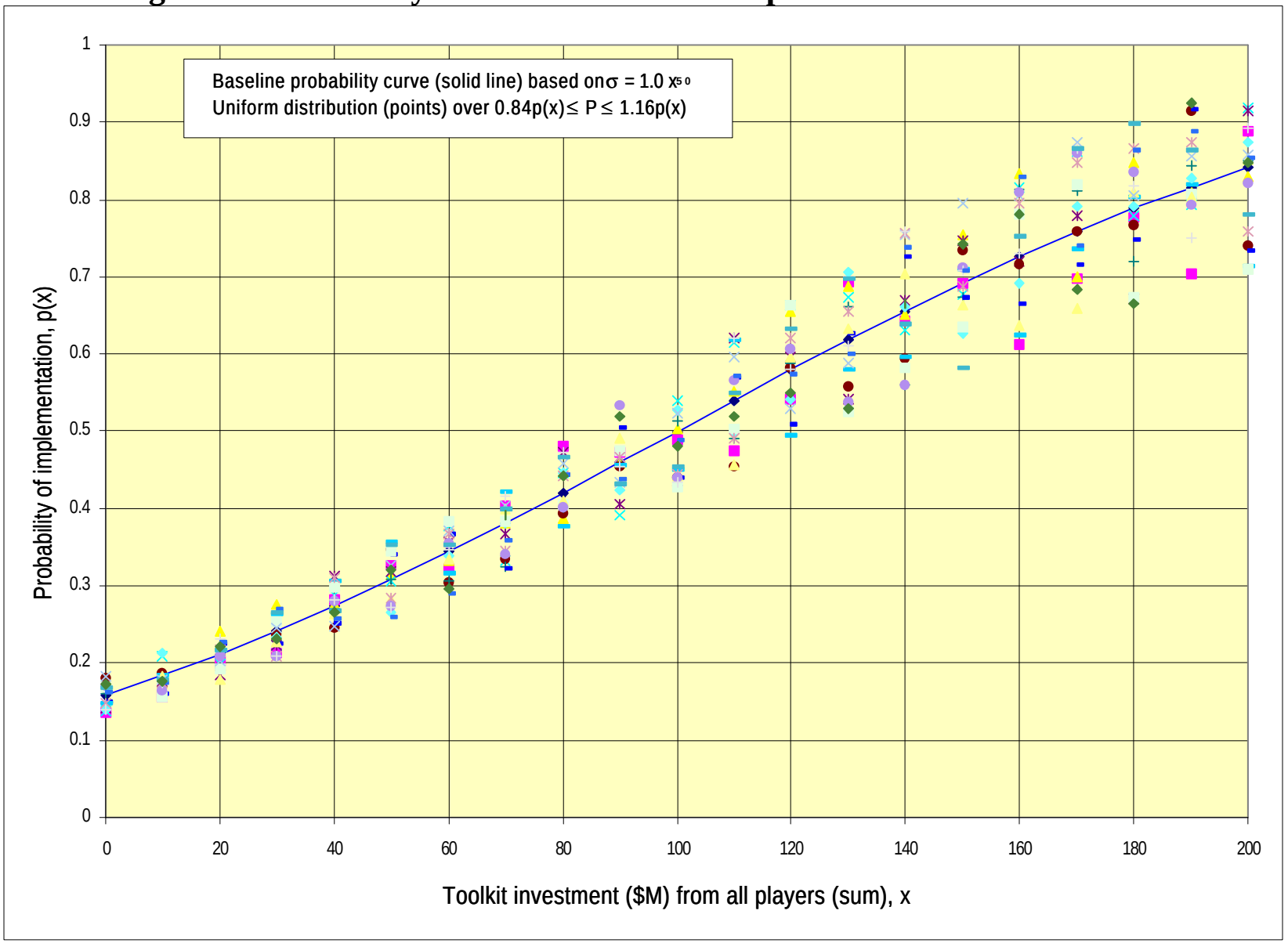

TABLE 8. TOOLKIT INVESTMENTS - DETAILED DESCRIPTIONS OF INITIAL TECHNOLOGY AND POLICY OPTIONS

Indicate the number of credits your team wants to spend for each option. The offer by all teams will be added for each option to get a total offering. The probability of an option being implemented increases with the total offering for that option so influencing other teams to add their offers to yours will improve your chances for success. Please circle your team name.

Role	Money ($M)	Role	Money ($M)
Consumers	300	Suppliers, Manufacturers	50
Providers 1	220	FDA, Regulators	80
Providers 2	220	Planning/Funding Organizations	50
Insurance Payers	220	Labs, Universities	30
Legislature	300	Lawyers, Judges	30

Technology Options	Cost for 50% chance	Your offer
Health Informatics		
T1. A secure local Internet-based health information system makes patient information accessible through wide area networks. (DD29)	90	_____
T2. A regional or national secure 'Personal Health Information System' with encoded cards containing essential medical information (histories, allergies, etc.) is implemented. Cost per card is twice that of issuing credit cards. (DD1; DD29)	50	_____
T3. An 'Integrated Information Technology System' that checks provider instructions against a database (with alarm and interlocks) is developed and implemented. The system can be accessed with existing computers. (DD1)	70	_____
T4. The 'Personal Health Information System (T2)' and 'Integrated Information Technology System (T3)' are developed and implemented simultaneously with full compatibility. (DD1; DD29)	110	_____
T5. An interactive multi-media system allows providers to interact with medical data and treatment variations for educational and practice purposes at $20K per system. Continuing medical education credit is given for the activity. (DD21; Training)	120	_____
T6. A secure national electronic auto-monitoring system keeps track of all procedures and allows access to current information for educational and practice purposes. Equipment costs are $20K per hospital with an additional $2K per room. (DD21; Training)	200	_____
Outcomes Research Tools		
T7. A widely accepted outcomes-based database is established and used as basis for medical treatment.	300	_____

T8. A national electronic medical record and information system that allows new procedures to be scientifically analyzed and compared to current procedures (cost, quality) is brought on line. Uses existing computers. (DD22) 80 _____

Minimally Invasive Therapies

T9. Injectable robotic micro/nano machines that find and mechanically remove atherosclerotic and other lesions become widely available at $20K per treatment. (DD2; DD15) 320 _____

T10. Computer guided microbeam radio-surgery capable of destroying tumors without seriously damaging adjacent tissues is developed at $1.5M per instrument and $7.5K per treatment. (DD18; other cancers) 200 _____

T11. A national center for Minimally Invasive Diagnostics and Therapy Research (MIDTR) is established where MIDT will be developed, demonstrated and evaluated. Includes construction costs. 250 _____

Advanced Diagnostics

T12. High-performance computing advances enable real-time processing and evaluation of 3-D medical images, and facilitates breakthroughs in computational biology and drug design. 50 _____

T13. The sensitivity of radionuclide imaging devices is improved by 100%. 100 _____

T14. A portable, quick microwave screening technique that can be used to detect metabolically active cells that are suggestive of cancer is discovered and implemented at $150K per instrument and $150 per treatment. (DD6; DD8; DD25) 100 _____

T15. A non-invasive scanning technique that can image entire organs in the body (with the option of a 3-D video map) or biopsied tissues becomes available at $1.2M per instrument and $600 per treatment. (DD8; DD18; DD25; DD27; DD28) 120 _____

T16. A panel of approved physician-interpreters is identified. An electronic agent regularly contacts each and assigns images to interpret. The electronic agent keeps accounting records. (DD7; DD8; Telemedicine) 30 _____

T17. Advanced image algorithms that screen chest radiographs, sputum cytologies, non-invasive scan images, video maps and biopsied tissue images to identify normals and abnormals are developed. (DD6; DD7; DD8; DD18; DD25; DD27; DD28) 60 _____

T18. An automated scanning technique that detects metastatic diseased tissue based on learned characteristics of a known diseased tissue sample becomes available at $1M per instrument and $500 per treatment. (DD28) 140 _____

T19. A new invasive technology to perform quantitative evaluation of coronary artery disease becomes available at $600K per instrument and $3K per treatment. (DD14) 80 _____

T20. A new non-invasive imaging technology to perform quantitative evaluation of coronary artery disease becomes available at $900K per instrument and $4K per treatment. (DD14) 350 _____

Telemedicine

T21. A device that provides a physician virtual-reality sensing, first aid and triaging through a paramedic surrogate becomes available at $80K per device and $150 per use. (DD3; DD30) 80 _____

T22. A mobile field CCU, ICU transport vehicle with medic and virtual-reality-with-sensors connection to remote critical care physician becomes available at $300K per vehicle and $600 per use. Option T20 is a prerequisite. (DD3; DD30) 40 _____

T23. A mobile field vehicle / trauma surgery suite / surgical assistant / virtual-reality-with-sensors connection to a remote surgeon for emergency tele-surgery is available at $500K per vehicle and $1000 per use. Option T20 is a prerequisite. (DD3; DD30) 60 _____

T24. A secure system which allows the patient to regularly and urgently connect via a telemedicine link to a health provider (who may be out-of-state) to receive or arrange for health care is made available at $400 per system. (DD13) 20 _____

T25. A secure system which allows a home health provider to connect via virtual-reality-telemedicine link to perform testing, transmit physical exam findings and discuss with a physician is made available at $70K per system. (DD13) 40 _____

Microelectronics and Sensors

T26. Vital signs monitors/transmitters become widely and inexpensively available at $200 per unit. (DD13) 30 _____

T27. A vital signs and blood chemistry (e.g., hemo, cholesterol, cell counts) monitor becomes widely available at $250 per unit. 50 _____

T28. Guided microsurgical instruments linked to 3-D anatomical displays replace traditional instruments at a cost of $130K per surgery unit. 200 _____

T29. Voice-controlled robotic assistants that can provide most or all care for paraplegic and quadriplegic patients become available at $70K per robot. Transportation and work-place facilitators provide additional aid. (DD26) 150 _____

T30. An integrated imaging, biopsy, tissue processing/diagnosis robotic apparatus that precisely performs the instructed biopsy and processes and diagnoses the abnormalities becomes available at $1.7M per instrument and $800 per treatment (DD28) 180 _____

T31. A compact device that keeps tabs on groups of injured people using non-invasive technology (e.g., microsensors with telemetry or infrared telethermometry) is made available at $80K per unit. (DD30) 60 _____

Energy Delivery Devices

T32. Laser-based microscopy enables early detection of disease-causing agents. 150 _____

T33. A laser device that removes (rather than fracturing or dilating) atherosclerotic lesions becomes available at $300K per instrument and $3K per treatment. (DD2; DD14) 80 _____

T34. A visually-controlled laser device that removes (rather than fracturing or dilating) atherosclerotic lesions becomes available at $450K per instrument and $4K per treatment. (DD2; DD14) 120 _____

Assistive Technologies for the Elderly/Disabled

T35. An artificial cartilage material that can be used to replace damaged cartilage and prevent osteoarthritis becomes available at $600 per treatment. (DD4) 70 _____

T36. A device that will differentially identify basic environmental elements using different sounds to provide talking sight to the blind becomes available at $12K per unit. (DD5) 80 _____

T37. A device that differentially identifies environmental elements and connects to the retina, optic nerve or cerebral cortex to result in useful sight becomes available at $28K per unit (DD5) 180 _____

T38. A cochlea implant that allows noise but not distinguishable speech to be heard becomes available at $6K. (DD11) 70 _____

T39. An artificial ear that would allow for speech perception becomes available at $14K. (DD11) 200 _____

T40. A light-weight, comfortable walking hip cast/exoskeleton with which a patient will walk until healing occurs becomes available at $3K. (DD12) 110 _____

T41. A machine that dispenses correct medicines per time with adjustments for VS becomes available at $2.5K. It also notifies patient to take medicines. Tele-link alarm for missed doses or out-of-range VS. (DD20) 40 _____

T42. A machine that dispenses correct medicines either orally or percutaneously per time with adjustments for VS becomes available at $3.5. Tele-link alarm for missed doses or out-of-range VS. (DD20) 60 _____

T43. Surface muscle stimulators that externally provide electrical stimulation of leg muscles with computer coordination for walking become available at $12K. (DD23) 80 _____

T44. A walking exoskeleton that allows use of arms and legs (walking) becomes available at $110K. This allows a quadriplegic patient to use predominantly self-care. (DD23; DD26) 200 _____

T45. A device providing liquid ventilation becomes available at $50K. It uses an oxygen and carbon dioxide carrying fluid (instead of air) as the ventilating medium. This would allow the lung to mature prior to breathing air. (DD24) 120 _____

T46. An artificial womb comprised of a fluid enclosed environment with an artificial placenta connected to the umbilical vessels and through which nutrients are received and waste products are eliminated becomes available at $150K. (DD24) 500 _____

Internal-Organ-Related Technologies

T47. A human-compatible xenogeneic heart obtained from genetic engineering of a suitably sized animal becomes available at $20K. Life-long anti-rejection drugs may or may not be needed. (DD9) 300 _____

T48. A new artificial heart with some external connection to assist or replace heart function becomes available at $30K. (DD9) 250 _____

T49. Tissue cultured and implantable human organs or replacement cells (heart, liver, pancreas, kidney) become available at $35K (DD9; DD10; DD17; lung, kidney replacement) 600 _____

T50. An implantable artificial pancreas with a sugar sensor and insulin reservoir that monitors and treats increases in blood sugar becomes available at $7K. The reservoir would need periodic filling with insulin. (DD10)	160	_____
T51. An external, artificial kidney that provides continuous (or at least, nocturnal) hemodialysis becomes available at $12K. Life expectancy and medical problems are expected to be much improved over traditional dialysis. (DD16)	180	_____
T52. Small implantable artificial organs (kidney, liver, lung) that function acceptably become available at $50K. Life expectancy and medical problems are expected to be much improved over traditional treatments. (DD16; DD17; DD19)	300	_____
T53. A liver dialysis machine that intermittently or continuously cleanses the blood of toxins usually cleared by the liver becomes available at $26K. (DD17)	180	_____
T54. A light-weight portable exoskeleton 'Iron Lung' that fits over the chest and through negative (and ± positive) pressure causes air to move in and out the lungs becomes available at $8K. (DD19)	110	_____
T55. Infusible artificial chlorophyll, a substance or micro-machine that absorbs carbon dioxide and releases oxygen in the blood stream becomes available at $8K. (DD19)	300	_____
T56. An external portable artificial lung that will take up oxygen from and eliminate carbon dioxide to the external environment becomes available at $30K. (DD19)	250	_____

Preventive

T57. Mobile cancer screening units become widely available for breast and colon cancer screens at the patients' locations. Costs are $500K per unit and $250 per screen. (DD6; DD8; DD25)	40	_____
T58. A 'safe' cigarette is developed that supplies the desired nicotine effect without delivering the tars and hydrocarbons that lead to the undesired effects. (DD18)	100	_____
T59. A system for patient education and behavior modification (diets, smoking cessation, exercise, etc.) becomes universally available	30	_____

Policy Options	**Cost for 50% chance**	**Your offer**
P1. The FDA reduces the time period for new technology testing by 50% by changing internal agency rules and procedures.	35	_____
P2. Medical malpractice lawsuit punitive damage cap set to $1,000,000.	400	_____
P3. A single-payer national health care system is implemented.	600	_____
P4. Congress establishes missions for the national laboratories which include biomedical technology transfer with industry.	40	_____
P5. FDA establishes international standards together with Europe and Japan, thereby expediting worldwide marketing of new products by harmonizing device and software testing requirements and reducing duplicative testing.	60	_____
P6. FDA develops pilot program to work together with industry to reduce the time to bring new technologies to market by 75% (using FAA-like Boeing 777 "model").	70	_____

P7. Medicare develops PPO managed care plan with patient option for doctor/treatment choice outside of plan at 20% of cost. 70 _____

P8. FDA implements a medical devices product development consultant accreditation process to reduce overhead time. 30 _____

P9. Given that P8 passes, additional steps are implemented to reduce the FDA review and approval time by 75%. Note this does not affect clinical trial time. 30 _____

P10. Congress establishes private savings accounts for health care along the current IRA model. Incentives are provided for private investments in biomedical technologies. 30 _____

MONEY - GAME DOLLARS

The function of money in the game is to introduce the concept of finite resources. This forces the players to create options and assign priorities that simulate real life. However, this game is complicated by the fact that it deals with individual patients and their treatments together with national issues related to government appropriations, research funding and performance, and overall industry income and outflow. A single currency definition cannot apply to all these situations and simultaneously provide the players with value measures that simulate reality. Hence, we have designed the following system to accommodate these diverse objectives. A discussion of the basis of our assumptions is provided in Appendix C.

All the bills circulating in the game are denominated in game dollars - $G. Game dollars come in two colors: green and yellow. Green dollars circulate primarily among the health delivery triad - consumers, providers, and insurers. Yellow dollars circulate *exclusively* within the national technology development system. For crossovers, conversion factors are printed on the bills. Table 9 illustrates the appropriate conversion factors.

Table 9. GAME DOLLARS COME IN TWO COLORS

Team	Dollar Type	Conversion for agreements, contracts
Consumers:	Green	$1 = $200
Provider 1:IPAs, individuals	Green	$1 = $200
Provider 2: HMOs	Green	$1 = $200
Insurance Payers:	Green	$1 = $200
Legislature	Green and Yellow	$1 = $1 for appropriations to health insurance $1 = $0.5 million for all other appropriations
Suppliers/Manufacturers	Yellow	$1 = $0.5 million
US FDA, Other Regulators	Yellow	$1 = $0.5 million
Planning/Funding Organizations	Yellow	$1 = $0.5 million
Universities/Laboratories	Yellow	$1 = $0.5 million
Lawyers	Green and Yellow	Depends on customer

Green dollars are used by consumers and insurers to pay for treatments and insurance policies (and any legal expenses related to an individual). If green dollars are used for any expense other than treatments (e.g., providers wishing to purchase products from suppliers or invest in research), each green dollar is worth $200.

Yellow dollars represent national expenses (research, manufacturing, etc.). In that environment, one game dollar represents $0.5 million. The two types of dollars allow the game to accurately estimate both the real costs to the patients for treatments and the real costs of research, developing, testing and manufacturing new technologies and products.

No money is allocated in Session 1. In Sessions 2-4, game dollars are allocated as shown in Table 10. Percentage entries in the 1996-7 column are estimated fractions of the total government health care outlay that went to different groups; the legislators can use these fractions as a guide for their future appropriations.

Table 10. TEAM AND PLAYER EXTERNAL INCOME PER SESSION

Team	1996-1997	1998-1999	2000-2001	2002-2003
Consumers: *Each player receives this amount.*		$45,000	$48,000	$52,000
Provider 1: IPAs, individuals				
Provider 2: HMOs				
Insurance Payers: Private States Medicare, Other Federal	 33.8% 64.7%	 TBA TBA	 TBA TBA	 TBA TBA
Legislature: Federal (66.2%) States (33.8%)		$180,000	$192,000	$208,000
Suppliers/Manufacturers		$800	$900	$1000
US FDA Other Regulators	0.1%	TBA	TBA	TBA
Planning/Funding Organizations Government (DoD, NSF, Koop, etc.) Private Foundations	 1.4%	 TBA $200	 TBA $200	 TBA $200
Universities/Laboratories				
Lawyers				

TBA: To be appropriated by the legislators

ADDITIONAL SPECIFIC TEAM INSTRUCTIONS

The game progression has been described in the section entitled "Playing the Game." All teams are expected to develop objectives and strategies to accomplish them, decide on Toolkit investments, etc. However, there are certain details that apply to specific teams. These are briefly discussed below.

Consumers:
The patients must divide evenly into private and government patients. The privately insured consumers can select insurance policies that apply to either the independent providers or the HMOs. The government patients may have only one policy to select. The sample policies are shown on the next three pages. Patients can discuss these policies with the Insurance team in Session 1, but they must purchase one policy within five minutes of the start of Session 2 (see below). Note that the Provider teams may initially compete for patients. However, in the event of a significant imbalance, the Control team will reassign patients. Patients receive their money from the recorder at the start of Session 2. After purchasing insurance, the patients will receive the D/D card assignment appropriate for their group (private or government) from the team recorder. They go to the Control team (Cheryl) to get two copies of the full D/D cards and related props, and follow the card instructions.

Provider Teams:
Provider Team 1 represents independent physicians and health care providers. Provider Team 2 represents HMOs. The Provider teams have all the current resources listed on the D/D cards (those that have no associated technology development costs), as well as their own staff of physicians, nurses, etc. In the first session, the providers will organize themselves to compete or collaborate with each other, the insurance payer team, and other stakeholders. They must decide how patients will be handled in the later sessions. Tasks should be clear to all, as the arrival of patients will greatly stress the team's abilities. They should also discuss access to equipment, sharing versus owning, capital costs versus operating costs, etc. The providers should play their roles as they would in real life.

Insurance Payers:
The team should divide into three or four components to address the private and public patients and the independent and managed-care providers.

The following three sample policies (and the basis for them) are provided to the team. They may modify the policies, but there should not be more than two policies (HMO and independent) for each group of patients. Failure to complete the three or four policies will result in defaulting back to the following samples:

Option 1: Independent Medical Care Plan - Private

- You may choose any doctor or hospital for care
- You pay a deductible, $3000 per session
- Maximum out-of-pocket limit of $20000 per session
- The plan covers 80% of usual and customary charges, you pay the balance
- The plan pays 100% of usual and customary above the out-of-pocket limit
- Medical/surgical authorization must be obtained in advance from the Insurance team
- Experimental and education procedures not covered
- Routine preventive care not covered (physicals, etc.)

- Cost of insurance plan (1998) - $35000 for Session 2

- Estimated cost of insurance plan (2000) - $38000 for Session 3
- Estimated cost of insurance plan (2002) - $42000 for Session 4

Coverage for SESSION _____

_____ _____

Patient Signature Insurance Signature

Basis for numbers:

Estimated real consumer health care spending (1998,9) - $5830 per capita
Game allocation per consumer (1998,9) - $45000 (average cost per DD card)
Ratio of game dollars to estimated real dollars - 7.7

THUS, Deductible wascosted at 770% of two years worth of deductibles (~$400)
Stop-loss was estimated the same way
Average out-of-pocket costs for DD cards based on above - $10000 per card
THUS, Insurance cost set at $35000 for Session 2

Option 2: HMO Plan - Private

- You must use HMO doctors and facilities
- No deductible within the system
- Maximum out-of-pocket limit of $20000 per session (Session 2 only)
- $1000 copayment for Emergency Room hospitalization
- $500 copayment for radiation treatments or rehabilitation
- Medical equipment (wheelchairs, prostheses, etc.) covered at 20%
- Routine preventive care covered
- All care must be coordinated through primary care physician
- Some procedures/illnesses are not covered
  __Organ transplants_____
  __Experimental or educational procedures_____
  _____
  _____

- Cost of insurance plan (1998) - $32000 for session 2

- Estimated cost of insurance plan (2000) - $35000 for Session 3
- Estimated cost of insurance plan (2002) - $39000 for Session 4

Coverage for SESSION _____

_____ _____

Patient Signature Insurance Signature

Basis for numbers:

Estimated real consumer health care spending (1998,9) - $5830 per capita
Game allocation per consumer (1998,9) - $45000 (average cost per DD card)
Ratio of game dollars to estimated real dollars - 7.7

THUS, Stop-loss wascosted at 770% of two years worth of stop-losses (~$2500)
Average out-of-pocket costs for DD cards based on above - $13000 per card
THUS, Insurance cost set at $32000 for Session 2

Option 3: Public Health Insurance - Government

- For GOVERNMENT PATIENTS ONLY - Money allocated by the legislature is available to supplement this policy.
- You may choose any doctor or hospital for care
- You pay a deductible, $3000 per session
- Maximum out-of-pocket limit of $20000 per session
- The plan covers 90% of usual and customary charges, you pay the balance
  This includes hospitalization, rehab, educational assistance, home health visits, etc.
- The plan pays 100% of usual and customary above the out-of-pocket limit
- Based on age/condition, authorization may not be granted for some treatments.
- Experimental procedures not covered
- Routine preventive care not covered (physicals, etc.)

- Cost of insurance plan (1998) - $35000 for Session 2

- Estimated cost of insurance plan (2000) - $38000 for Session 3
- Estimated cost of insurance plan (2002) - $42000 for Session 4

Coverage for SESSION _____

_____ _____

Patient Signature Insurance Signature

Basis for numbers:

See notes for Option 1

Note to Payers:

Although the current Medicare system has parts A and B, the DD cards in the game are not structured to split hospital and physician costs. Therefore, in the above policy, the two are not separated as they should be. Please do not let this detract you from modifying the public health insurance in any way you feel is good and appropriate. The Prosperity Game directors will try to modify other parts of the game to help implement your changes into the game.

The insurance payers can influence the future by creatively altering these policies as a result of negotiations with consumers, providers, the legislature, etc. Hence, the insurers are free to deliberate, and convey their thoughts through written policies.

LEGISLATORS:
Within realistic and practical constraints, legislators begin to decide how much federal money will be spent on Medicare/Medicaid and biomedical technology research in future years. They decide how the money is to be allocated and give patients and research institutions their fractions. All allocations must be completed and delivered prior to the applicable session. Failure to allocate funds will result in the Control team making appropriations.

SUPPLIERS/MANUFACTURERS:
Your team receives allocations that simulate income from the sale of pre-existing technologies. You may use this income to invest in new technologies, gain patent rights, conduct clinical trials, build facilities to manufacture new products, etc. Ultimately you will want to sell new products to the providers. You "win" the game by significantly growing your businesses.

FDA, STATE REGULATORS:
You play a crucial role in the game, as in real life. Explore creative solutions to reduce the time and costs required to bring new technologies to market. Consider ways to measure costs, benefits and risks of either excessive delays or inadequate testing. Consider different approaches to experimental treatments where both patients and providers are willing to accept higher than normal risks.

PLANNING/FUNDING ORGANIZATIONS:
Prioritizing research tasks has become a major policy issue in the US. Consider how much money is available and the best ways to spend it. Negotiate with all affected stakeholders.

UNIVERSITIES/NATIONAL LABORATORIES:
National labs, research institutes and universities discuss their core competencies, develop partnerships with each other, with doctors, hospitals, suppliers, manufacturers, etc. Create strategies to develop new or improve existing technologies. Begin to seek funding from Congress, and other major biomedical funding and development organizations.

LAWYERS:
Your team is the most unstructured in the game. Your contributions and accomplishments depend strongly on your own initiatives. How can the legal profession contribute to lowering costs for health care technology? Be creative; look for win-win solutions to the multitude of technology and policy issues.

RULES OF PLAY

CHARITY:

The game is not structured to handle charitable contributions outside the existing Medicaid and governmental provisions. All services must be paid for personally or through public or private insurance. Patients unable to pay for treatments cannot receive those treatments (except for emergency care). However, bankers are available (Control team) to discuss extenuating circumstances.

CONTRACTS:

Contracts or agreements can be carried out between any two or more teams. Contracts must describe an exchange of value for value. All contracts must use the standard form (see Figure 7) and be legibly written. A Control team member must be present at the formalization of any contract, which must be in writing; a member of the Control team must sign and date the agreement for it to be valid. If the success or failure of the contract is determined probabilistically, Control will perform the necessary calculations and report the results to the parties immediately. Success or failure will be determined by sampling from a normal distribution with the actual sum invested. For example, investing twice the median estimate will produce a probability of success of 84.1%; superimposed on this probability is another probability distribution that represents uncertainties and risks that are not necessarily reduced by larger investments.

DISPUTES:

All disputes will be resolved by the Control team, whose decisions are binding.

LAWSUITS:

Lawsuits can be filed at any time by any team. An odd number (at least 3) of judges must hear the case. After both sides have presented their arguments, the judges decide by majority rule. Judges' decisions are final and binding. Litigants must appear before the judges at their scheduled times. If one litigant is one minute late, a judgment will be immediately rendered in favor of the litigant who is present. If both litigants are five minutes late, the case will be dismissed; the litigants will need to reschedule their court times.

SCHEDULES, APPOINTMENTS

It is essential that all players strictly follow the agenda and be on time for their appointments. Penalties will be assessed for players or teams that are late.

TOOLKIT OPTIONS

Investments in Toolkit options must be turned in before the deadline. Investment amounts should be legibly written on the Toolkit forms. Completed forms must be submitted to the Control team prior to the deadline. Players and teams cannot exceed their maximum total investments shown on the forms. Results of the investments will be announced and implemented into the play of the game. Only one opportunity is available for Toolkit investments.

Teams or players who wish to create new options must follow these steps: 1. Write up option clearly; 2. Discuss it with a designated member of the Control team; if accepted, Control will assign a median success probability; 3. Provide all investors with written copies of the new option, together with the amount they will invest, and the signature of the team facilitator; 4. Bring option and investments to Control before deadline. Marketing of new options to other teams is the responsibility of the initiating team. New technology investments outside the Toolkit follow a similar process.

APPENDIX A: BIOMEDICAL PROSPERITY GAME: LIST OF PLAYERS

BIOMEDICAL PROSPERITY GAME
NOVEMBER 1-3, 1995
Preliminary List of Players

NAME	ADDRESS	PHONE #	FAX #	ROLE
CONSUMERS				
Bestgen, Dr. Robert, VP for Administration	The Lovelace Institutes, 2425 Ridgecrest Drive, Albuquerque, NM 87108-5127	505-262-7255	505-262-7043	
Boyce, Dr. Joe	Sandia National Laboratories, Emergency Medical Services, MS1018, P.O. Box 5800, Albuquerque, NM 87185-1018	505-844-4486	505-844-2608	
Dawson, Dr. Steve	Massachusetts General Hospital, Center for Innovative Minimally Invasive Therapy, 32 Fruit Street, Boston, MA 02114	617-726-5278	617-726-4891	
Middleton, Dr. Blackford, VP, Clinical Systems	MedicaLogic, 15400 NW Greenbriar Parkway, Suite 400, Beaverton, OR 97006	503-531-7000	503-531-7001	
Myers, Dr. Dennis, Administrative Director Research & Educ. Division	Scott and White Hospital, 2401 South 31st Street, Temple, TX 76508	817-724-2987	817-724-4079	
Padilla, Gil	Presbyterian Hospital, Biomedical Technical Services, P.O. Box 26666, Albuquerque, NM 87125-6666	505-841-1159	505-841-1951	
Wiesmann, Colonel William,	Combat Casualty Care Research Program, U.S. Army Medical Research & Material Command, Attn: MCMR-PLB, Fort Detrick, Frederick, MD 21702-5012	301-619-7591	301-619-7067	
Wick, Dr. Timothy, Associate Professor	Georgia Institute of Technology, School of Chemical Engineering, 778 Atlantic Drive, Atlanta, GA 30332-0100	404-894-8795	404-894-2866	
Yonas, Dr. Gerry, VP, Information and Pulse Power Res. & Tech. Division	Sandia National Laboratories, MS0151, P.O. Box 5800, Albuquerque, NM 87185-0151	505-845-9820	505-844-6307	
Garcia, Marie	SNL, MS0127, Org. 4501, Alb. NM 87185-0127	505-844-9444	505-844-1218	Facilit/Analyst
Shaw, Gladys	SNL, MS1379, Org. 4500, Alb. NM 87185-0131	505-284-2421	505-844-0619	Recorder
PROVIDERS 1: INDEPENDENTS				
Boom, Dr. Ried	500 Tanglewood, Manchester, IA 52057	319-927-6960	319-927-5247	
Franken, Dr. Edmund, Professor of Radiology	University of Iowa, College of Medicine, 200 Hawkins Drive, Iowa City, IA 52242	319-356-3391	319-356-2220	

Horvath, Dr. Andrew, Sr. VP	Presbyterian Healthcare Services, P.O. Box 26666, Albuquerque, NM 87125-6666	505-841-1442	505-841-1861	
Rattner, Dr. David, Director, Center for Innovative Minimally Invasive Therapy	Massachusetts General Hospital, ACC337, 32 Fruit Street, Boston, MA 02114	617-726-1893	617-726-0355	
Re, Dr. Richard, VP & Director of Research	Alton Ochsner Medical Foundation, 1516 Jefferson Highway, New Orleans, LA 70121	504-842-3135	504-842-3899	
Smith, Quentin	Baylor College of Medicine, 2323 S. Shepherd, Suite 1000, Houston, TX 77019	713-520-0232	713-520-5785	
Warren, Dr. Larry, Sr. Assoc. Director & Chief Operating Officer	University of Michigan Hospitals, D4213 MPB, 1500 E. Medical Center Drive, Ann Arbor, MI 48109-0718	313-764-9526	313-936-6534	
Yonas, Dr. Howard	Presbyterian University Hospital, Department of Neurological Surgery, 200 Lothrop St., Suite B400, Pittsburgh, PA 15213	412-648-6812	412-648-6820	
VanDevender, Dr. J. Pace, Director, National Industrial Alliances Center	SNL, MS1180, Org. 4700, Alb. NM 87185-1180	505-844-5148	505-844-5163	Facilit/Analyst
Schoeneman, Paula	SNL, MS0339, Org. 1880, Alb. NM 87185-0339	505-845-8543	505-844-9126	Recorder
PROVIDERS-2: HMOs				
Alverson, Dr. Dale, Clinical Director	Professor of Pediatrics & OB/GYN, University of NM School of Medicine, Albuquerque, NM 87131	505-272-3967	505-272-6845	
Davila, Dr. Fidel	Scott & White Clinic, Dept. of Medicine, 2401 South 31st Street, Temple, TX 76508	817-724-2377	817-724-4899	
Gollub, Dr. Roger	Albuquerque Area Indian Health Service, 505 Marquette Avenue, NW, Albuquerque, NM 87102	505-248-5427	505-248-5441	
Gray, Dr. David	Washington University School of Medicine, 4444 Forrest Park, St. Louis, MO 63108	314-286-1600	314-286-1601	
Kelly, Howard, Director of Strategic Development	Baxter Healthcare Corporation, Rt. 120 & Wilson Road, Round Lake IL 60073	708-270-5858	708-270-5897	
Krousel-Wood, Dr. Marie	Alton Ochsner Medical Foundation, 1516 Jefferson Highway, New Orleans, LA 70121	504-842-3562	504-842-3899	
Krummel, Dr. Thomas, Chairman	College of Medicine, Penn State University, Box 850, Hershey, PA 17033	717-531-0939	717-531-3969	
Osborn, Lynn, Executive Director, MGH Laser Center	Massachusetts General Hospital, BHX 630, 32 Fruit Street, Boston, MA 02114	617-726-2327	617-726-4103	
Schroeder, Dr. Don	SNL, MS0985, Org. 2605, Alb. NM 87185-0985	505-845-8409	505-844-5916	Facilit/Analyst
Nenninger, Connie	SNL, MS0127, Org. 12670, Alb. NM 87185-0127	505-844-2146	505-844-1218	Recorder

INSURANCE PAYERS				
Bolmey, Mr. Armando, Manager, Analytical Services	Kaiser Permanente, 393 East Walnut Street, 6th Floor, Pasadena, CA 91188	818-405-3251	818-405-6646	
Guthrie, Dr. Marvin, VP, Patents, Licensing & Industry Sponsored Research	Massachusetts General Hospital, 13th Street, Bldg. 149, Suite 1101, Charlestown, MA 02129	617-726-2128	617-726-1668	
Kelly, Howard, Director of Strategic Development	Baxter Healthcare Corporation, Rt. 120 & Wilson Road, Round Lake IL 60073	708-270-5858	708-270-5897	
Moorman, Flora Jane, Assistant to the President	P.O. Box 13547, #15 Alexander Drive, Research Triangle Park, NC 27709	919-541-9366	919-990-9544	
Patterson, Mr. Bruce W.	NC Health Care Info Communications Alliance, Inc., 2 Davis Dr., Research Triangle Park, NC 27603-8003	919-733-4131	919-715-3562	
Richards, Jeff, Senior Consultant	Fleishman-Hillard Inc.,1301 Connecticut Ave NW, Washington DC 20036	202-659-0330	202-296-6119	
Schlessinger, Leonard, Manager, Biomathematical Analysis	Kaiser Permanente, 393 East Walnut Street, 6th Floor, Pasadena, CA 91188	818-405-6092	818-405-6646	
Allen, Dr. George	SNL, MS0756, Org. 6651, Alb. NM 87185-0756	505-844-9769	505-844-0968	Facilitator
Nelson, Dr. Jennifer	SNL, MS0719, Org. 6621, Alb. NM 87185-0719	505-845-8348	505-844-0543	Analyst/Rec.
LEGISLATORS				
Fitzmaurice, Dr. Michael	AHCPR, Dept. of Health & Human Services, 5600 Fishers Lane, Rockville, MD 20857	301-443-1986	301-594-2333	
Goodman, Dr. Clifford, Consultant	Health Care Technology Assessment, 4501 Connecticut Avenue NW, #816, Washington DC 20008-3733	202-362-0323	202-362-0323	
Hanlon, Pamela, President & CEO	Community Medical Network Society, 5500 Interstate N. Parkway, #435, Atlanta, GA 30328-4662	404-850-0540	404-850-9616	
Millman, Diane, Attorney at Law	McDermott, Will, Emery, 1850 K Street, NW, Suite 450, Washington, DC 20006	202-887-8000	202-778-8335	
Mort, Dr. Elizabeth, Director of Quality Measurement, Clinical Care Mgmt Unit	Massachusetts General Hospital, 50 Stanford St. 9th Floor, Boston, MA 02114	617-726-4106	617-726-4120	
Tichenor, Suzy, VP	Council on Competitiveness, 1401 H Street NW, Suite 650, Washington DC 20005	202-682-4292	202-682-5150	
Waconda, Josephine, Director	Albuquerque Area Indian Health Service, 505 Marquette, NW, Suite 1525, Albuquerque, NM 87102	505-248-5429	505-248-5441	
Domenici, Kathy	420 Bryn Mawr, SE, Alb. NM 87106	505-256-4755		Facilit/Analyst
Savage, Kristy	SNL, MS1180, Org. 4700, Alb. NM 87185-1180	505-844-5180	505-844-5163	Recorder

SUPPLIERS/MANUFACTURERS				
Bendicksen, Ms. Beverly, Director	Technology Ventures Corporation, 1155 University Blvd., SE, Albuquerque., NM 87106	505-843-4288	505-246-2891	
Buchanan, Mr. George, Director, Business Communications	Hughes Electronics Company, P.O. Box 92919, Bldg. R11; M/S M352, Los Angeles, CA 90009	310-364-7070	310-322-1454	
Lindauer, Barbara, Business Development	Robotic Systems Technology (RST), 1110 Business Parkway South, Westminster, MD 21157	410-876-9200	410-876-9476	
Mottle, Kent, Director	Emerging Information Technologies, Johnson and Johnson, One Johnson and Johnson Plaza, New Brunwsick, NJ 08933	908-524-2991	908-524-2580	
Smith, Laura	The Institute for Rehabilitation Research/ILRU, 2323 S. Shepherd, Suite 1000, Houston, TX 77019	713-520-0232	713-520-5785	
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APPENDIX B: GAME SCHEDULE

Wednesday, November 1, 1995

5:00 pm Participant registration and badging; collect materials.

5:30 pm Players gather in Conference Center; get acquainted with team members. "Hello" process; go to assigned tables.

6:00 pm Welcome: Sam Varnado, J. Pace VanDevender.

6:15 pm Dinner with your team members.

7:00 pm Prosperity Game briefing/overview with questions and answers; polling (Marshall Berman -- Game Director)

8:00 pm Formal meeting adjourned. Private team meetings and discussions may begin.

Thursday, November 2, 1995

7:30 am Continental Breakfast

SESSION 1 - January 1, 1996:

8:00 am Morning "Hellos." Players go to assigned tables.

8:15 am Facilitators lead teams in initial assignments:

All teams Set ground rules for deliberation, decision-making, etc. Develop game, team and personal objectives and strategies to meet the challenges. Define the different roles appropriate to your team and which players will represent each role: Insurance Payers (Medicare/Medicaid, private companies); Legislators (Federal, State); FDA, Regulators (FDA, state agencies); Planning/Funding Organizations (private foundations, DoD, NSF, Koop, etc.); Suppliers (represent several companies, a single consortium, etc.); Universities/Laboratories (universities, research hospitals, national labs, etc.); Lawyers (patent attorneys, malpractice specialists, etc.). Develop strategies to meet the challenges defined in the Players' Handbook; begin to implement those strategies. Prepare Toolkit Investments. Make appointments with other teams to begin preliminary negotiations.

Consumers Voluntarily or by lot, divide into two even groups: private consumers and government consumers (elderly, poor, or military). Similarly, the private and public consumers should individually consider the insurance coverage. Get the corresponding 1998 insurance policies from the Insurer team.

Providers Decide on roles (doctor and specialty, nurse, administrator, etc.), teaming, sharing equipment capital and operating costs. Divide up work and begin play. Review the Disease/Disability (D/D) cards in preparation for Session 2. Discuss the provider-specific D/D cards.

Insurance Payers Review current policy options with consumers. Begin to develop innovative policy concepts for the future.

10:00 am ***Consumer Recorder gives 1998 money to each consumers***

10:10 am ***Consumers complete purchase of insurance policies.***

Legislators complete 1998 appropriations; Recorder disburses money. Control (Cheryl) disburses money to Suppliers/Manufacturers and Private Foundations.

10:15 am Break

SESSION 2 - January 1, 1998:

10:30 am Radio news broadcast.

10:35 am Patients receive D/D cards numbers from Consumer Recorder; go to Control team (Cheryl) to get D/D cards and props; follow directions for medical treatment.

11:30 am ***Complete all Toolkit investments and submit only your own team's options to Control team. No further Toolkit investments are allowed after 11:30 am.***

12:00 pm Lunch

12:05 pm Radio news broadcast.

SESSION 3 - January 1, 2000:

1:00 pm ***Consumer Recorder gives 1998 money to each consumers***

1:15 pm ***Consumers complete purchase of 2000 insurance policies. Legislators complete 2000 appropriations; Recorder disburses money. Control (Cheryl) disburses money to Suppliers/Manufacturers and Private Foundations.***

1:30 pm Successful Toolkit investments are announced and implemented.

1:35 pm Patients receive new D/D card numbers from Consumer Recorder (unless their previous disease requires them to continue treatment); go to Control team (Cheryl) to get D/D cards and props; follow directions for medical treatment.
Other teams continue deliberations and negotiations.

2:55 pm Radio news broadcast.

SESSION 4 - January 1, 2002:

3:00 pm ***Consumer Recorder gives 2002 money to each consumers***

3:15 pm ***Consumers complete purchase of 2002 insurance policies. Legislators complete 2002 appropriations; Recorder disburses money. Control (Cheryl) disburses money to Suppliers/Manufacturers and Private Foundations.***

3:30 pm Successful technologies and policies that have been negotiated among the teams are announced and implemented into the game.

3:35 pm Patients receive new D/D card numbers from Consumer Recorder (unless their previous disease requires them to continue treatment); go to Control team (Cheryl) to get D/D cards and props; follow directions for medical treatment.
Other teams continue deliberations and negotiations.

4:55 pm Final radio broadcast.

5:00 pm End of day's activities.

5:30 pm Banquet dinner.

6:15 pm Dinner speaker: Dr. Richard Re, Alton Ochsner Medical Foundation.

7:00 pm Adjourn

Friday, November 3, 1995

7:30 am Continental Breakfast

SESSION 5 - Identify Problems and Solution Areas by Team

8:00 am Teams identify issues, problems, challenges and potential solutions.

9:00 am Map issues onto technology and policy solution areas. Define new solution areas if necessary. Prioritize issues and select most important one. Select spokesperson to present and discuss the key issue.

9:30 am Issue Debriefing - Plenary Session: The most important technology and policy issues faced by the nation. Five minutes for each team. Innovator polling to determine preference for technology and policy areas.

10:30 am Break. Team tables relabeled. Technology/Policy Area matrix maps copied and placed on tables.

SESSION 6 - Roadmapping Technologies and Policies

10:45 am Players reassemble by technology and policy areas in which they are interested. (Tables will be relabeled.) Groups review issue-area matrix maps to assimilate cross-cuts. Technology groups define vision, applications/objectives, drivers, sub-technologies, and sponsoring organizations for their areas. Policy groups refine solutions and explore related strategies, tactics, positives, negatives, and costs.

12:30 pm Working Lunch

12:45 - 1:00 Dr. Steve Dawson, Massachusetts General Hospital.

SESSION 7 - Roadmapping continued

1:30 pm Continue the exercise from Session 6. Groups should be into detailed discussions and explorations.***Complete all inputs by 3:00 pm.***

3:00 pm Break. End of Session 7. Players return to original team tables.

3:15 pm Teams prepare final briefing on the entire game; select spokesperson.

3:45 pm Team debriefings; no more than 5-7 minutes each.

4:45 pm Wrap up; final polling; fill out evaluation forms; sign up for roadmaps off.

5:00 pm Game adjourned.

APPENDIX C: HEALTH CARE EXPENDITURES

Figure C-1 shows the predicted health care costs that were used in developing the game dollar allocation system used in the Prosperity Game. Seven years of data were extrapolated out to the year 2002. A quadratic curve fit most of the data extremely well, and was used for projecting into the future. (The quadratic rise of expenditures also highlights the extreme importance of controlling health care costs in the US.) Table C-1 shows the predicted and estimated allocations. Where data were not available, reasonable guesses were made.

TABLE C-1. ESTIMATES OF PROJECTED HEALTH CARE COSTS PER YEAR

Team	1996 per capita	1996 $billions	1998 per capita	2000 per capita	2002 per capita
Consumers: Out of pocket Private insurance payouts	$850 $1750	$212.5 $437.5	$2915	$3245	$3590
Government insurance payouts States Medicare Other Fed.	 $750 $850 $586	 $187.5 $212.5 $146.5			
Government total costs: $2250 Federal: $1500 States: $750			$2780 total	$3265 total	$3785 total
Suppliers/Manufacturers (5%)					
US FDA	$4	$1			
Research Funding Organizations Government (DoD, NSF, etc.) Private Foundations	 $60 $5	 $15 $1.25	 $5	 $5	 $5
Total dollars available =	$4855	$1213.75	$5700	$6515	$7380

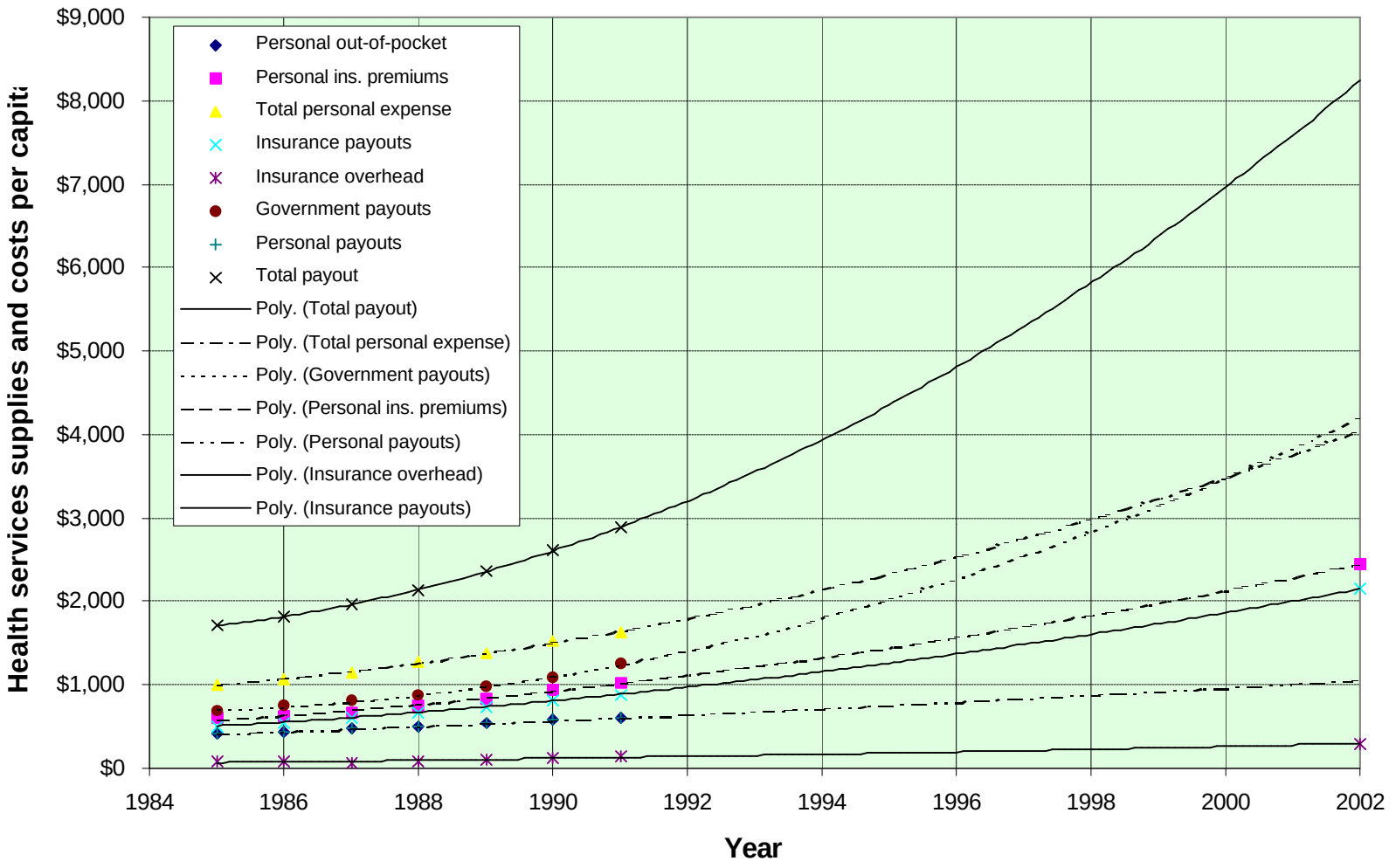
For 1996, consumers will pay approximately $2600 per capita for health care; of this, $850 is direct out-of-pocket expense, and $1750 goes to insurance premiums on average.

Total government spending on health care for 1996 is assumed to be $2250, of which $750 is spent by states, $850 on Medicare, $586 on other federal costs, $4 for the FDA, and $60 on federally supported research and development. An additional $5 is assumed to be provided by private foundations in support of research. These costs amount to more than a trillion dollars in 1996 and approach two trillion by 2002.

In the game, funds have been allocated to approximate these anticipated expenditures. However, many simplifications were required. For example, the Suppliers/Manufacturers are given $800 game dollars in 1998, corresponding to a purchasing power of $400 million. The intent was to allow the team to influence the game, but not dominate the technology system. Other team incomes were similarly adjusted to balance reality and game influence.

Table C-1 shows that private consumers and the government each pay about half of the patient health care costs. However, the extrapolations shown in Figure C-1 predict that the government fraction will exceed the private fraction by the year 2000. For the game, we assumed that these costs were split evenly between public and private payers.

Figure C-1. Health Care Costs: 1985-1991 data extrapolated to 2002



The following table provides some additional information on the fractions of the national health costs that were used in different segments of the medical community.

Percentage allocations of health care resources in the US in 1991:

Hospital care	38.4%
Physicians' services	18.9
Dentists' services	4.9
Other professional services	4.8
Home health care	1.3
Drugs/other medical nondurables	8.1
Vision products/other medical durables	1.6
Nursing home care	8.0
Other health services	1.9
Net cost of insurance and administration	5.8
Government public health activities	3.3
Medical research (separately allocated)	1.7
Medical facilities construction	1.4

APPENDIX D: ADDITIONAL INFORMATION

US Food and Drug Administration:

FDA's Vision

FDA in the year 2000 will be ...

* A strong science-based agency--to accurately detect and assess health risks, and to set appropriate standards.

* A trusted agency--to enforce the Food, Drug, and Cosmetic Act fairly, uphold safety standards, and protect consumers.

* An enabling agency--to steward needed products and to promote public health.

* A collaborative agency--to strengthen ties to scientific, health provider, and regulatory communities both domestically and internationally.

* A high-performance agency--to capitalize on state-of-the-art information and communication technologies and management systems to enhance performance.

* An employee-valued agency--to recruit, develop and advance employees equitably, and to position the agency to meet the changing work force needs of the 21st century.

FDA principally serves the general public in its health and safety mission. FDA also recognizes its responsibilities to the industries that it regulates and will work with them in shepherding new technologies to the marketplace. Thus it strives to maximize public health protection while minimizing regulatory burden.

FDA's Center for Devices and Radiological Health

Medical Devices and Radiological Health

FDA's Center for Devices and Radiological Health is responsible for ensuring the safety and effectiveness of medical devices and eliminating unnecessary human exposure to man-made radiation from medical, occupational and consumer products. There are thousands of types of medical devices, from heart pacemakers to contact lenses. Radiation-emitting products regulated by FDA include microwave ovens, video display terminals, and medical ultrasound and x-ray machines. The center accomplishes its mission by:

- reviewing requests to research or market medical devices
- collecting, analyzing, and acting on information about injuries and other experiences in the use of medical devices and radiation-emitting electronic products
- setting and enforcing good manufacturing practice regulations and performance standards for radiation-emitting electronic products and medical devices
- monitoring compliance and surveillance programs for medical devices and radiation-emitting electronic products
- providing technical and other nonfinancial assistance to small manufacturers of medical devices.

In July 1993, FDA implemented the following policies to streamline and improve the medical device review process:

- "Refuse to File"—a preliminary review of minimum criteria for filing PMA, IDE, and 510(k) submissions
- "Triage"—a method for allocating review resources according to the public health risk associated with a device
- "Expedited Review"—an expansion of existing "fast track" review procedures for live-saving devices to include devices offering other significant clinical benefits.

A PATIENT'S BILL OF RIGHTS

Source: American Hospital Association. © copyright 1972

Often, as a hospital patient, you feel you have little control over your circumstances. You do, however have some important rights. They have been enumerated by the American Hospital Association.

1. The patient has the right to considerate and respectful care.
2. The patient has the right to obtain from his physician complete current information concerning his diagnosis, treatment, and prognosis in terms the patient can be expected to understand. When it is not medically advisable to give such information to the patient, the information should be made available to an appropriate person in his behalf. He has the right to know, by name, the physician responsible for coordinating his care.
3. The patient has the right to receive from his physician information necessary to give informed consent prior to the start of any procedure and/or treatment. Except in emergencies, such information for informed consent should include but not necessarily be limited to the specific procedure and/or treatment, the medically significant risks involved, and the probable duration of incapacitation. Where medically significant alternatives for care or treatment exist, or when the patient requests information concerning medical alternatives, the patient has the right to such information. The patient also has the right to know the name of the person responsible for the procedures and/or treatment.
4. The patient has the right to refuse treatment to the extent permitted by law and to be informed of the medical consequences of his action.
5. The patient has the right to every consideration of his privacy concerning his own medical care program. Case discussion, consultation, examination, and treatment are confidential and should be conducted discreetly. Those not directly involved in his care must have the permission of the patient to be present.
6. The patient has the right to expect that all communications and records pertaining to his care should be treated as confidential.
7. The patient has the right to expect that within its capacity a hospital must make reasonable response to the request of a patient for services. The hospital must provide evaluation, service, and/or referral as indicated by the urgency of the case. When medically permissible a patient may be transferred to another facility only after he has received complete information and explanation concerning the need for and alternatives to such a transfer. The receiving institution must first have accepted the patient for transfer.
8. The patient has the right to obtain information as to any relationship of his hospital to other health care and education institutions insofar as this care is concerned. The patient has the right to obtain information as to the existence of any professional relationships among individuals, by name, who are treating him.
9. The patient has the right to be advised if the hospital proposes to engage in or perform human experimentation affecting his care or treatment. The patient has the right to refuse to participate in such research projects.
10. The patient has the right to expect reasonable continuity of care. He has the right to know in advance what appointment times and physicians are available and where. The patient has the right to expect that the hospital will provide a mechanism whereby he is informed by his physician of the patient's continuing health care requirements following discharge.
11. The patient has the right to examine and receive an explanation of his bill, regardless of the source of payment.
12. The patient has the right to know what hospital rules and regulations apply to his conduct as a patient.

APPENDIX E: GLOSSARY AND ACRONYMS

510(k) One of two ways that new devices enter the market; entry is through a premarket notification process, known as "510(k) because it is authorized under section 510(k) of the Federal Food, Drug , and Cosmetic Act. (See also PMA.) The FDA must determine whether a device is "substantially equivalent" to a device that is already legally marketed.

allogeneic Having a different genetic constitution but belonging to the same species.

arteriosclerosis: Term applied to a number of pathological conditions in which there are thickening, hardening, and loss of elasticity of the walls of arteries; the leading cause of death and serious morbidity in the Western world.

atherosclerosis: The most common form of arteriosclerosis

Biomedical Technology: A field of health care that deals with medical devices, diagnostic products and health care information systems.

cochlea A winding cone-shaped tube forming a portion of the inner ear. It contains the organ of Corti, the receptor for hearing.

CCU Coronary Care Unit

Cytology The science that deals with the formation, structure and function of cells.

D/D Disease/Disability

DoD Department of Defense

FDA US Food and Drug Administration

Health Informatics: The exploitation of information technologies to promote the management and delivery of health care.

hemodialysis Providing the function of the kidneys by circulating blood through tubes made of semipermeable membranes.

HMO Health Maintenance Organization

ICU Intensive Care Unit

IDE Devices can be exported to countries not on the list of advanced industrialized countries if the exporter has an Investigational Device Exemption (IDE) permitting testing on humans in the US, the importing country has given FDA a blanket import approval, and the device is in compliance with the importing country's laws.

IPA Independent Practice Association

ischemia Local and temporary deficiency of blood supply due to the obstruction of the circulation to a part.

LOS Length of Stay

metastasis Movement of bacteria or body cells (esp. cancer cells) from one part of the body to another.

micro- one millionth-

morbidity The number of sick persons or cases of disease in relationship to a specific population.

nano- one billionth-

NSF National Science Foundation

osteoarthritis	A chronic disease involving the joints, especially those bearing weight. This disease is an almost inevitable consequence of aging and is a major cause of severe chronic disability, affecting nearly 10% of the population over 60.
PMA	One of two ways that new devices enter the market; entry is through an extensive premarket approval (PMA) application. (See also 510(k).)
PPO	Preferred Provider Organization
R&D	Research and Development
ROI	Return on Investment
RTW	Return to Work
sputum	Substance expelled by coughing or clearing the throat.
Technology Roadmap:	A strategic plan that collaboratively identifies product and process performance targets and obstacles, technology alternatives and milestones, and a common technology path for R&D activities."
triage	The screening and classification of sick, wounded, or injured persons during war or other disasters to determine priority needs for efficient use of medical systems.
VS	vital signs
xenogeneic	Tissues used for transplantation that are obtained from a species different from that of the recipient.